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SOVIET REGIONAL DEVELOPMENT IN 1960-69: TRENDS AND IMPLICATIONS

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SOVIET REGIONAL DEVELOPMENT IN 1960-69: TRENDS AND IMPLICATIONS

HIGHLIGHTS

Despite the official call for economic equality among the several regions and republics of the USSR, regional disparities in per capita income, industrial output, and agricultural production increased substantially during the 1960s. By the end of the decade, those regions with the lowest levels of development in 1960—the Central Asian[1] and Transcaucasian republics—had fallen even further behind the rest of the country in terms of per capita income and output. The principal reasons for this situation are extremely rapid population growth in the poorer regions, investment allocations that were not designed for reducing regional differences, and the low productivity of labor and capital in many of the less developed regions.

Population growth in the Central Asian and Transcaucasian republics has been much greater than in any other area of the country over the past decade, primarily because of their high rates of natural increase. Interregional migration patterns, however, also contributed to regional disparities in population growth—reducing growth in areas with relatively low rates of natural increase and augmenting growth in areas already having relatively high rates of natural increase. Migration into the southern regions has been influenced by Soviet wage policy. Existing regional wage differentials are insufficient to compensate for the rigors of living in remote or climatically severe regions and make the southern cities far more attractive places of residence than the cold uncongenial areas of Siberia and the Urals.

The slowest growing areas in the country in terms of per capita national income are Azerbaydzhan, Uzbekistan, and Turkmenia, while the fastest growing are Lithuania, Belorussia, and Moldavia. In the three lagging regions, growth rates of population were among the highest in the country, whereas national income growth was slower than in any other region because of the very low growth rates of industrial output. Conversely, the rapid growth of Lithuania, Belorussia, and Moldavia is reflected in above-average increases in national income, industrial output, and agricultural production together with much lower growth rates for population.

Investment allocations during the 1960s have not been oriented consistently toward reducing regional differences in production and income. Two of the poorer republics—the Kazakh and Turkmen Republics—received more investment funds per capita than wealthier republics, but much of this capital was directed toward the exploitation of particularly rich mineral and fuel deposits.

[1] Throughout this paper, the term Central Asia includes the Kazakh Republic.

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On the other hand, the Georgian, Kirgiz, and Tadzhik Republics were given investment allocations barely half as large as those funneled into the Kazakh Republic. Whether actual investment policy has been to maximize national economic growth rather than to effect regional parity is uncertain. Policy statements are confused and the results are mixed. Although industrial investments have not favored consistently those republics in which the productivity of combined labor and capital inputs was highest, investment allocations have not reflected a planners' goal of reducing regional disparities.

A serious impediment to narrowing the differences in regional levels of development is the relatively low growth of productivity of labor and capital in many of the poorer regions. Over the past decade, industrial output per unit of combined inputs has grown very little in the less developed republics. In some cases—Uzbekistan, Turkmenia, and Azerbaydzhan—industrial output grew at rates below the national average as a decline in productivity offset the above-average growth of combined inputs of labor and capital.

The present status of regional development confronts Soviet planners and political leaders with a policy dilemma. A significant reduction of regional income differentials and maximum national economic growth cannot be achieved simultaneously through investment strategy alone. Those regions that appear to have the best investment opportunities are not the regions with the lowest income per capita. Moreover, the 1971-75 plan data for the republics suggest that the geographic pattern of development will not change radically over the next five years. The new five-year plan gives no prospect of reducing regional income differentials by a coordinated redistribution of both capital and labor. Thus the regional disparities in development levels are likely to persist with little change during the new plan period. In fact, if planned industrial growth must depend primarily on increases in factor productivity, as stated by the leadership, the development gaps may continue to increase, with the less developed republics falling still further behind the rest of the country.

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DISCUSSION

INTRODUCTION

Although Soviet economic development has proceeded rapidly, its geographic incidence has been very uneven. The persistent large differences in per capita income and production among regions are surprising in view of the longstanding Soviet goal of providing an even distribution of productive forces (meaning industry primarily) over the entire country. However, the lack of progress in this regard could, until around 1960, be explained by the imperatives of the early industrialization drive, World War II, and the recovery from war.

The emphasis on speedy development, in conjunction with the shortage of capital during the 1920s and 1930s, encouraged growth at existing industrial centers, which were to a large extent the traditional manufacturing centers in the European part of Tsarist Russia. Moreover, the massive transfer of industries eastward in 1940-43 was still not sufficient to overcome the imbalance in the distribution of production. After the war, the concern with reconstruction coupled with a highly centralized branch principle of planning brought about a territorial distribution of economic activity very little different from that existing in 1945. Only after the mid 1950s, particularly with the creation of the councils of national economy in 1957, did attention to regional aspects of economic development increase appreciably.[2]

The purpose of this paper is to assess the results of Soviet regional development policy during the 1950s. After the framework of this policy is set out briefly, statistics on per capita national income, gross industrial output, and agricultural output are examined for the 15 union republics and, where possible, the ten economic regions of the Russian Soviet Federated Socialist Republic—RSFSR[3] (see Figure 1). National income cannot be calculated for the regions of the RSFSR, so their relative levels of development are shown in terms of the two major contributing sectors to national income—industrial and agricultural output. Industrial output per capita is a particularly useful indicator because industrial development is the leading edge of Soviet growth strategy. Therefore, the implications of that strategy for regional development should be most visible in statistics on regional industrial output.

Next, regional trends in population growth are presented. Because the examination of output, income, and population shows that regional differentials were greater at the end of the 1960s than at the beginning, the paper goes on to investigate the reasons for the failure to narrow the income gaps among regions. Finally, since some of the reasons have clear implications for current and future Soviet economic policy and growth, these implications are discussed in the concluding section of the paper.

---

[2] Councils of national economy were established as a system of regional units in an abortive attempt to facilitate economic decisionmaking by decentralizing economic management. The system was abolished in 1965.

[3] For primary data used in calculating regional trends in per capita national income, industrial and agricultural output, and factor productivity, see Appendix A. National income and industrial production data were derived from official Soviet statistics and reflect Soviet concepts and biases. The effects of such biases are discussed in Appendix B, including Tables B-1, B-2, and B-3. The regional values of agricultural output were estimated from price and quantity data for 17 agricultural products.

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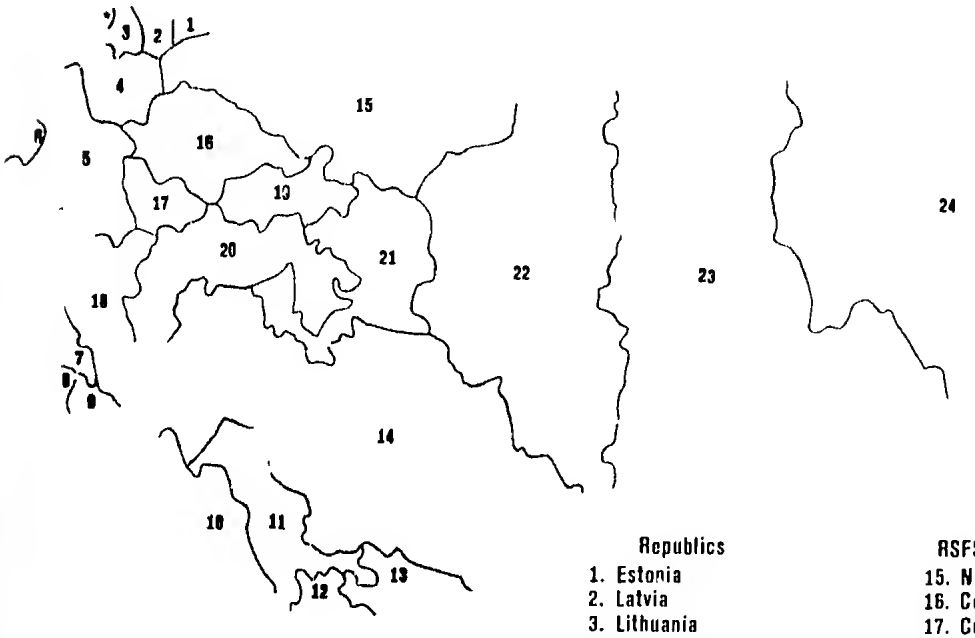
USSR: Union Republics and RSFSR Economic Regions, 1971

Figure 1



Russian Republic

Minority National Republics

Republics

1. Estonia
2. Latvia
3. Lithuania
4. Belorussia
5. Ukraine
6. Moldavia
7. Georgia
8. Armenia
9. Azerbaydzhan
10. Turkmen
11. Uzbek
12. Tadzhik
13. Kirgiz
14. Kazakh

RSFSR Economic Regions

15. Northwest
16. Center
17. Central Chernozem
18. North Caucasus
19. Volga-Vyatka
20. Volga Valley
21. Urals
22. West Siberia
23. East Siberia
24. Far East

*Kaliningrad Oblast': included in the statistical data of the Northwest region.

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SOVIET POLICY TOWARD REGIONAL DEVELOPMENT

The Soviet Minorities

Diversity is the most striking characteristic of the Soviet population. Nearly 170 nationalities and about as many languages form the ethnic and linguistic composition of the USSR. However, most of these ethnic groups are quite small relative to the total population. Only 11 constitute more than 1% of the total population and only six, more than 2%. Nevertheless, these six nationalities comprise the bulk of two ethnic groupings with vastly different cultures and attitudes. The Russian, Ukrainian, and Belorussian nationalities make up the bulk of the Slavic peoples and together account for 74% of the total population; the Uzbeks, Tatars, and Kazakhs belong to the Turkic group and account for 8.5% of the population. The largest single nationality is the Russian, with 53.4% of the total population in 1970. Nearly 84% of these people live within the RSFSR, wherein they comprise almost 83% of that republic's population. Russians also make up the largest nationality (43%) in Kazakhstan, and in all other republics they rank either second or third. Only in Armenia, Georgia, and Lithuania do Russians comprise less than 10% of the population.

Although the Soviets officially proclaim equality among the nationalities, Russian dominance generally pervades the political and economic life of the minority groups. Minority languages, literature, and arts are still supported and even encouraged, but the use of the Russian language increases throughout the USSR, and Russians continue to migrate to the cities of traditionally non-Russian areas, where they hold many of the key positions as managers, professionals, and technicians. The other nationality groups, particularly the nationalities of the Central Asian republics, are generally less widely distributed than the Russians. These groups are heavily concentrated in their respective republics and usually form significant minorities only in immediately adjacent non-Russian republics.

The number of non-Russian people who claim Russian as their native language has been inching upward (11.5% of the population in 1970 compared with 10.8% in 1959). Most of this increase has occurred among the Ukrainians, Jews, and Belorussians, and the percent of the non-Russian population speaking Russian fluently as a second language is generally greatest among the Slavic and other Indo-European groups. Linguistic assimilation has been more difficult to achieve among the Turkic peoples, owing partly to the more rapid rate of growth of these peoples and partly to the much stronger cultural differences between the Turkic and the Russian peoples.

Policy Aims

Because of ideological considerations, one of the goals of Soviet economic policy has been to equalize levels of development throughout the country. Originally part of Lenin's "nationalities policy"—which considered economic equality a prerequisite to political, social, and cultural equality and the eventual creation of a Communist society—this aim was set forth specifically in terms of industrial development in the resolutions of the 10th Party Congress in 1921. Economic equality among the nationalities was to be achieved by transferring industry to the areas of minority nationalities.[4]

---

[4] Kommunisticheskaya Partiya Sovetskogo Soyuza v rezolyetsiyakh i resheniyakh s"yezdov, konferentsiy i plenumov tsentral'nogo komiteta, Moscow, vol I, 1954, p. 560. Although what the Soviets meant by equality is not clear (for example, per capita industrial output, per capita real income, or some other measure), they apparently intended to equalize economic development in general and believed that industrialization was the most effective means to this end.

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Following the 15th Party Congress in 1927, which ushered in the Great Industrialization Drive, the goal of equality was overshadowed by the concern for rapid industrialization[5] and maximum production at minimum cost.[6] Since the less developed areas were less favorably endowed with the infrastructure necessary for the rapid development of heavy industry (the primary focus of the industrialization drive[7]) they received an insignificant share of the total investment.[8] As a result, little progress was made in the pursuit of regional parity.

Nevertheless, for political and ideological reasons, equalization of levels of development among regions and republics has remained a tenet of Soviet development policy, and the definition of "development" has been broadened to include production in sectors other than industry.[9] In its present form, Soviet development policy incorporates the objectives of both regional parity and maximum production. Current statements on development policy, although somewhat ambiguous, seem to assign equal priority to both aims, or, at least, to be founded on the belief that the objectives are consistent.[10]

In fact, conflicts arise in attempting to achieve both regional parity and maximum production simultaneously. Since the best investment opportunities are not necessarily in the less developed regions, heavy investment allocations to these regions could be inconsistent with the goal of maximizing overall pro-

---

[5] The 15th Party Congress ordered pursuit of the equalization goal to proceed within the constraints of national interests. (**Ibid.**, vol II, p. 463.)

[6] Pishchayev, V., "K postanovke problemy geograficheskogo razmeshcheniya promyshlennosti SSSR," **Problemy ekonomiki**, no 6, 1931, p. 102.

[7] As Naum Jasny has pointed out,

> For years, indeed for the whole period covered in this monograph [1928-52], almost the whole economy was geared to produce ever more steel for the construction of ever more steel and other heavy-industry factories, as well as for the output of ever more armaments.

(Jasny, **Soviet Industrialization, 1928-52**, Chicago, 1961, p. 3.)

CPYRGHT

[8] Koropeckyj, I.S., "The Development of Soviet Location Theory Before the Second World War," **Soviet Studies**, no 2, 1967, p 243. Koropeckyj argues convincingly that the emphasis on increased development of the already established industrial centers during this period was motivated primarily by defense considerations—that is, heavy industry was considered the backbone of defense, and rapid development of heavy industry was considered the most expedient means to military preparedness.

[9] Several Soviet specialists have indicated that the equalization of development levels includes equalizing the level of "well-being" of the population. However, there is little agreement as to the methodology for measuring "well-being." For example, see Telepko, L.N., **Urovni ekonomicheskogo razvitiya rayonov SSSR**, Moscow, 1971, and Vedishchev, A.I., "Soizmereniye urovney khozyaystvennogo razvitiya ekonomicheskikh rayonov SSSR, in Ivanchenko, A.A. (ed.) **Ekonomicheskiye problemy razmeshcheniya proizvoditel'nykh sil SSSR**, Moscow, 1969.

[10] For example, in his speech to the 24th Party Congress in 1971, Kosygin stated,

> One of the most important conditions for increasing the efficiency of social production is the correct siting of productive forces, which ensures the further industrial development of all the union republics and the consistent implementation of the Leninist nationalities policy.

(**Pravda**, 7 Apr 1971, pp. 2-7, cited in the **Current Digest of Soviet Press**, vol 23, no 16, p. 4.)

Also, N.N. Nekrasov (Chairman of the Council for the Study of Productive Forces) recently said,

> The general plan for the development and distribution of productive forces for the period up to 1980 [includes] further equalization of the levels of economic development of the union republics and economic regions of the USSR, improvement in the interrepublic division of labor and production relations, etc.

(**Planovoye khozyaystvo**, no 6, Jun 1971, p. 90.)

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duction.[11] Moreover, where relative retardation of economic growth in a region is the result of initial underdevelopment combined with rapid population growth, rather than failure to adapt to changing conditions from a previous position of equality, the movement of capital (including educational capital) into the underdeveloped region may have little effect if not accompanied by a movement of labor out of the region.

The successful solution to the regional problem involves, in general, the application of the principle that each resource be moved to the place where it contributes most to production. If investment opportunities are greater in the well developed regions, then the primary means of moving toward regional parity must be the movement of labor out of the less developed regions. This is the familiar "north-south" problem as exemplified by the American South. In practice, differences in educational levels, cultures, languages, etc., may hinder population movement; the migration north in the United States has been going on for generations. Although adjustment is slow, the migration process can be a powerful factor in reducing regional income differentials. A good example is Brazil during the 1950s, where, despite the flow of private capital from the less developed Northeast to the relatively well developed Center-South, the migration of population in the same direction resulted in a narrowing of regional income differentials over the decade.[12] A somewhat different case is that of Puerto Rico, where emigration to the United States acted as a safety valve to population growth, and an influx of US capital provided the wherewithal for per capita income growth.[13]

REGIONAL TRENDS IN PER CAPITA NATIONAL INCOME, INDUSTRIAL OUTPUT, AND AGRICULTURAL PRODUCTION

Regional Differences in 1960

In 1960, Soviet economic regions could be classified into three basic categories: (1) the well-populated industrially developed regions of the European USSR, containing collectively more than two-thirds of the country's population and three-fourths of the industrial employment; (2) the sparsely populated pioneer regions of Siberia and the Far East, with only one-tenth of both the total population and industrial employment; and (3) the well-populated, industrially underdeveloped regions of Central Asia, Transcaucasia, and the North Caucasus, encompassing one-fifth of the population but only slightly more than one-tenth of the industrial employment. The data in Table 1 clearly show the large differences in the level of economic development among the individual regions of the USSR.

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[11] However, if investment in the less developed regions, particularly those bordering on China, is motivated primarily by overall defense interests as suggested in a recent article by I.S. Koropeckyj, then the regional parity aim could be consistent with national interests even if it conflicted with the goal of maximizing production. For a more complete treatment of the defense motivation in investment decisions, see Koropeckyj, "Industrial Location Policy in the USSR During the Postwar Period," US Congress, Joint Economic Committee print, **Economic Performance and the Military Burden in the Soviet Union** Washington, 1970, pp. 262-285.

[12] Graham, D.H., "Divergent and Convergent Regional Economic Growth and Internal Migration in Brazil—1940-1960," **Economic Development and Cultural Change,** vol 18, no 3, Apr 1970, pp. 362-382. See also Baer, Werner, "Regional Inequality and Economic Growth in Brazil," **Economic Development and Cultural Change,** vol 13, no 3, Apr 1964, pp. 268-285.

[13] Stahl, J.E., "An Application of a Klein Growth Model to Puerto Rico, 1947-61," **Economic Development and Cultural Change,** vol 13, no 4, part I, Jul 1965, p. 471.

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Table 1

USSR: Per Capita Regional Production in 1960[a]

	Per Capita National Income		Per Capita Industrial Output (GVO)		Per Capita Agricultural Output	
	Rubles	Rank	Rubles	Rank	Rubles	Rank
Latvia	940	1	933	1	348	3
Estonia	899	2	971	3	378	1
RSFSR economic regions	765	3	820	N.A.	223	N.A.
Center			1,185	1	176	19
Northwest[b]			1,167	2	124	22
Urals			930	5	203	16
Far East			737	7	99	24
Volga-Vyatka			653	8	217	13
Volga Valley			645	9	274	11
West Siberia			621	10	288	8
North Caucasus			600	11	300	7
East Siberia			594	12	210	14
Central Chernozem			311	24	335	4
Lithuania	678	4	519	15	356	2
Ukraine	675	5	775	6	285	10
Azerbaydzhan	560	6	461	16	123	23
Armenia	522	7	584	13	128	21
Moldavia	521	8	393	19	287	9
Belorussia	517	9	451	17	323	5
Kazakh	511	10	403	18	321	6
Turkmen	509	11	340	23	205	15
Georgia	484	12	522	14	144	20
Uzbek	460	13	359	21	241	12
Kirgiz	449	14	369	20	195	17
Tadzhik	380	15	352	22	178	18
USSR	691		724		244	

[a] In all regions, per capita industrial output and per capita agricultural output together exceed the value shown for per capita national income because the three indicators of development are based on different prices and concepts. The national income data are based on 1958 prices and reflect the Marxist conception of net income which includes only the net product of the "productive" sectors. On the other hand, the industrial output data are based on 1955 prices and reflect the gross output of industry, which includes doublecounting of some products. The agricultural data are based on three-year moving averages in 1968 prices and reflect production estimates net of intra-agricultural uses of farm products but not excluding doublecounting of purchases from other sectors.

The derivation of these data is described in the notes to Appendix Table A–2.

[b] Including Kaliningrad Oblast'.

As indicated in Table 1, the western republics, including the RSFSR, started the decade with the highest levels of per capita national income, while the republics of Central Asia and Transcaucasia had levels of national income per capita considerably below the national average. Not surprisingly, the levels of industrial output per capita in 1960 fell into the same general pattern.

In terms of agricultural output,[14] the picture was somewhat different. While the Baltic republics and the Ukraine were again among the leading regions, the Central Chernozem region, Belorussia, Kazakhstan, and Moldavia made up for part of their industrial backwardness with above-average agricultural production. However, in the remaining Central Asian republics and all of Trans-

[14] It should be noted that while agricultural production per capita provides an indication of the relative weight of agriculture in a region's economy it may not provide a true measure of agricultural development—that is, agriculture may account for a relatively small share of national income in a region and still be highly developed in terms of output per unit of inputs.

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caucasia, per capita farm output trailed behind the national average. The was also the case in some of the industrially developed regions within the RSFSR specifically the Ural, Center, and Northwest regions. In East Siberia and the Far East, where farming is limited by climate and transportation problems, the levels of per capita agricultural production were also below the national average.

Special mention should be made of the three economic regions east of the Urals. West Siberia, East Siberia, and the Far East. By 1960 these regions already were near or above the national average in terms of per capita industrial production. Nevertheless, much of this territory, particularly in the Far East and East Siberia, consists of virtually uninhabited wilderness, as the harsh physical and climatic conditions found there have seriously hampered development consonant with their resource base. Much greater financial outlays are required to establish and maintain the necessary facilities for permanent settlements in these areas than in any other part of the country. Although the Soviet leadership has clung to the hope that the vast potential resources of these regions would provide the impetus for self sustained growth and the development of a major market area, this has not yet occurred.

Regional Development in the 1960s

The inability of the less developed Soviet regions to keep pace with the rest of the country is the most striking feature of regional development in the 1960s. Contrary to what might be the expected pattern for a nation whose policy ostensibly is to achieve regional equality, those regions with the lowest levels of development in 1960 did not generally grow more rapidly during the 1960s than the areas already highly developed by 1960. In fact, percentage increases in per capita national income (see Figure 2) were lowest in the republics of Central Asia and Transcaucasia. Moreover, with the exception of Kazakhstan, republics that grew at rates below the national average during 1961-65 fell even further behind during 1966-69.

Thus the gaps between these less developed regions and the rest of the country have been growing, as shown in Figure 3. The range of variation in the levels of per capita national income among the union republics, which was nearly 600 rubles in 1960, extending from 45% below to 36% above the national average, approached 1,100 rubles by 1969, ranging from 54% below to 41% above the national average.[15] Since Soviet national income data exclude any valuation for services, the differences between the two extremes probably would be even greater if national income were measured by Western concepts, which include values of services. Of those republics in which per capita national income was below the all-union average in 1960, only Lithuania and the Ukraine were able to close the gaps (which were minimal in 1960) between themselves and the national average. While Moldavia and Belorussia still remain at levels below the national average, their positions improved considerably relative to the Central Asian and Transcaucasian republics. For the remaining republics, the 1960 deviations from average per capita national income (both positive and negative) increased considerably over the decade.

[15] The coefficient of variation, which measures the relative dispersion of the republican data around the mean for the USSR, increased from 0.283 in 1960 to 0.355 in 1969. In other words, the relative standard deviation from the average for the USSR was greater in 1969 than in 1960, indicating greater regional disparity in development levels at the end of the decade.

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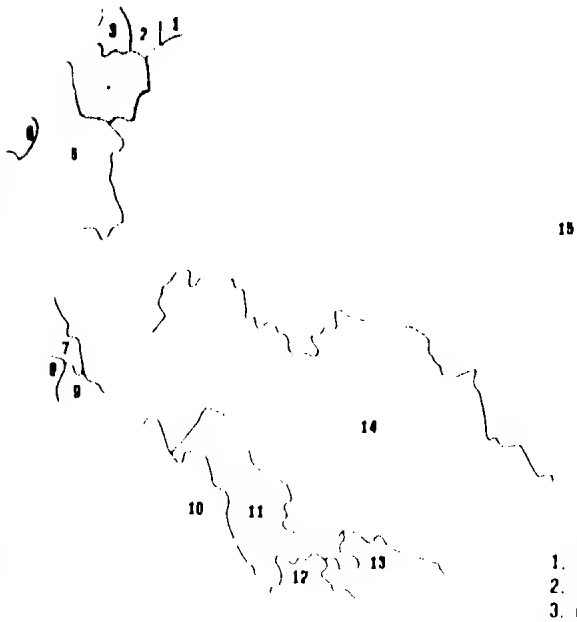
USSR: Regional Variations in Average Annual Growth of Per Capita National Income, 1961-69*

Figure 2

All Union Average 5.5% per Year



Significantly above average (more than 6.0% per year)

Average growth (5.0% to 6.0% per year)

Significantly below average (less than 5.0% per year)

Average Annual Rate of Growth (%)

1. Estonia	6.3	9. Azerbaydzhan	1.7
2. Latvia	5.9	10. Turkmen	1.7
3. Lithuania	7.9	11. Uzbek	2.5
4. Belorussia	6.9	12. Tadzhik	3.6
5. Ukraine	5.9	13. Kirgiz	4.5
6. Moldavia	6.7	14. Kazakh	4.8
7. Georgia	4.6	15. RSFSR	5.8
8. Armenia	5.3		

*Source: Appendix Table A-1

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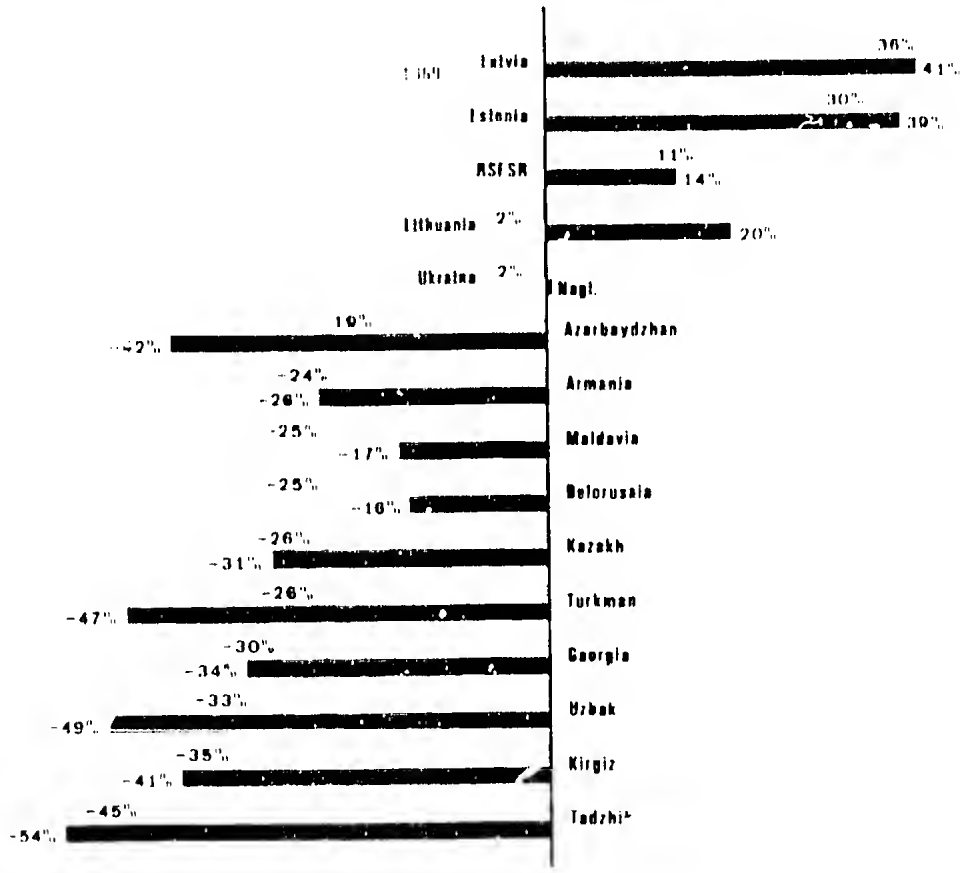
Figure 3

USSR: Regional Gaps in Per Capita National Income

(Percent Above or Below Soviet Average)



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In terms of per capita industrial production, the record is only slightly better.[16] (see Figure 1) Lithuania, Belorussia, Moldavia, and the Central Chernozem, Volga, and Siberian regions, all of which had below-average levels of development in 1960, showed relatively high growth rates characteristic of the usual "low level-fast growth, high level-slow growth" pattern. The relatively low growth rates in the highly developed Northwest and Central regions also conformed to the pattern. However, of the five Central Asian and three Transcaucasian republics, only Kirgizia grew faster than the national average over the whole time span.

As a result of these differences in rates of growth, the relative standing of the republics and RSFSR economic regions in terms of per capita industrial production shifted appreciably (see Figure 5). In general, the western and Baltic republics and most regions of the RSFSR gained at the expense of the long dominant Central and Northwest regions. The North Caucasus, Armenia, and Kazakhstan slipped slightly while Georgia, Azerbaydzhan, and the Uzbek, Tadzhik, and Turkmen Republics, which were well behind in 1960, fell still further in the rankings in 1961-69.

The pattern of regional variations in per capita agricultural growth resembles the regional differences in gains in per capita industrial production, although the absolute range of variation was considerably smaller. Growth was greatest in the Center and the Central Chernozem regions of the RSFSR, in Moldavia, Belorussia, and Lithuania, and in the Volga-Vyatka region; it was least (or negative) in Central Asia and Transcaucasia (see Figure 6). Of those regions with below-average levels of per capita farm output in 1960, only the Center, Urals, Volga-Vyatka, and the Far East regions of the RSFSR and the Georgian and Turkmen Republics moved toward the national average in relative terms between 1960 and 1969.[17] (see Figure 7).

Thus the trends in per capita national income and industrial and agricultural production all confirm the presence of a large and growing disparity in economic development between the less developed areas (Central Asia, the Transcaucasus, and the North Caucasus region) and the rest of the country. While the economies of all regions have progressed in the last decade, the rate of progress in the less developed regions has been too slow for these regions to begin catching up to the rest of the country.

REGIONAL TRENDS IN POPULATION GROWTH

Natural Increase

The wide regional differences in population growth in the USSR during the 1960s (see Figure 8) reflect patterns of growth that are characteristic of the development process throughout much of the world. The lowest rates of natural increase[18] occurred primarily in the European areas of the country (see Table 2), where urbanization is fairly well established and where per capita income is high. Conversely the highest rates are in Central Asia and the Caucasus where per capita income is low.

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[16] The coefficient of variation increased slightly from 0.383 in 1960 to 0.385 in 1969.

[17] The coefficient of variation showed an increase from 0.343 in 1960 to 0.396 in 1969.

[18] The natural rate of population increase is the difference between the birth rate and the death rate and equals the numerical increase per 1,000 of the existing population.

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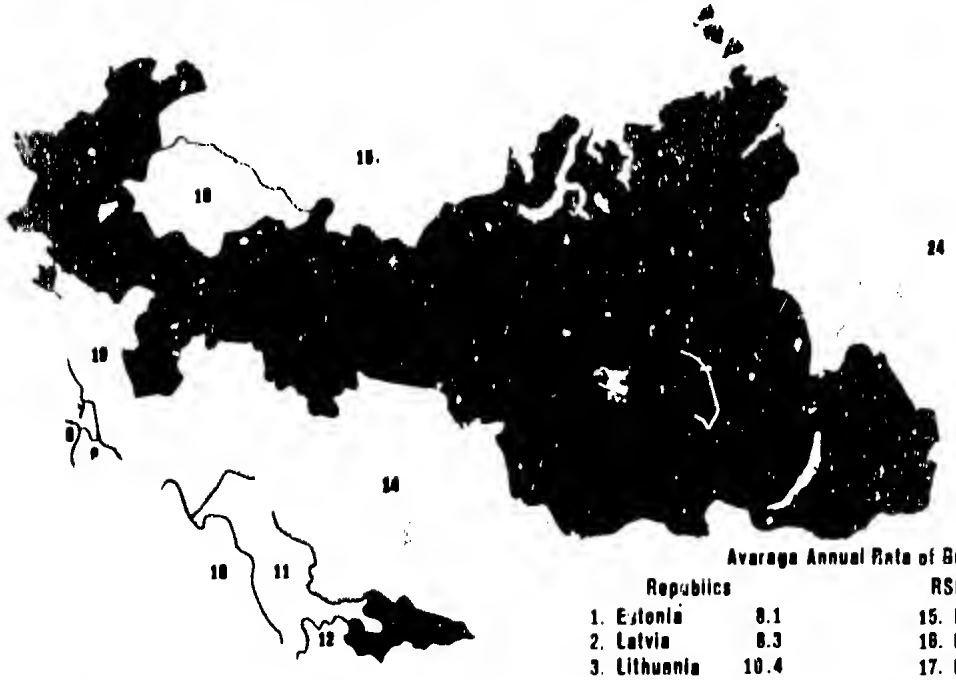
USSR: Regional Variations in Average Annual Growth of Per Capita Industrial Production, 1961-69*

Figure 4

All-Union Average - 6.9% per Year



Significantly above average (more than 7.4% per year)

Average growth (6.4% to 7.4% per year)

Significantly below average (less than 6.4% per year)

*Source: Appendix Table A-1.

Average Annual Rate of Growth (%)

Republics		RSFSR Economic Regions	
1. Estonia	8.1	15. Northwest	5.8
2. Latvia	8.3	16. Center	5.8
3. Lithuania	10.4	17. Central Chernozem	9.4
4. Belorussia	10.2	18. North Caucasus	8.7
5. Ukraine	7.6	19. Volga-Vyatka	8.8
6. Moldavia	9.1	20. Volga Valley	8.6
7. Georgia	8.3	21. Urals	7.6
8. Armania	8.9	22. West Siberia	7.9
9. Azerbaydzhan	3.5	23. East Siberia	8.5
10. Turkman	3.2	24. Far East	7.3
11. Uzbak	3.4		
12 Tadzhik	4.9		
.. Irgiz	7.9		
14. Kazakh	6.8		

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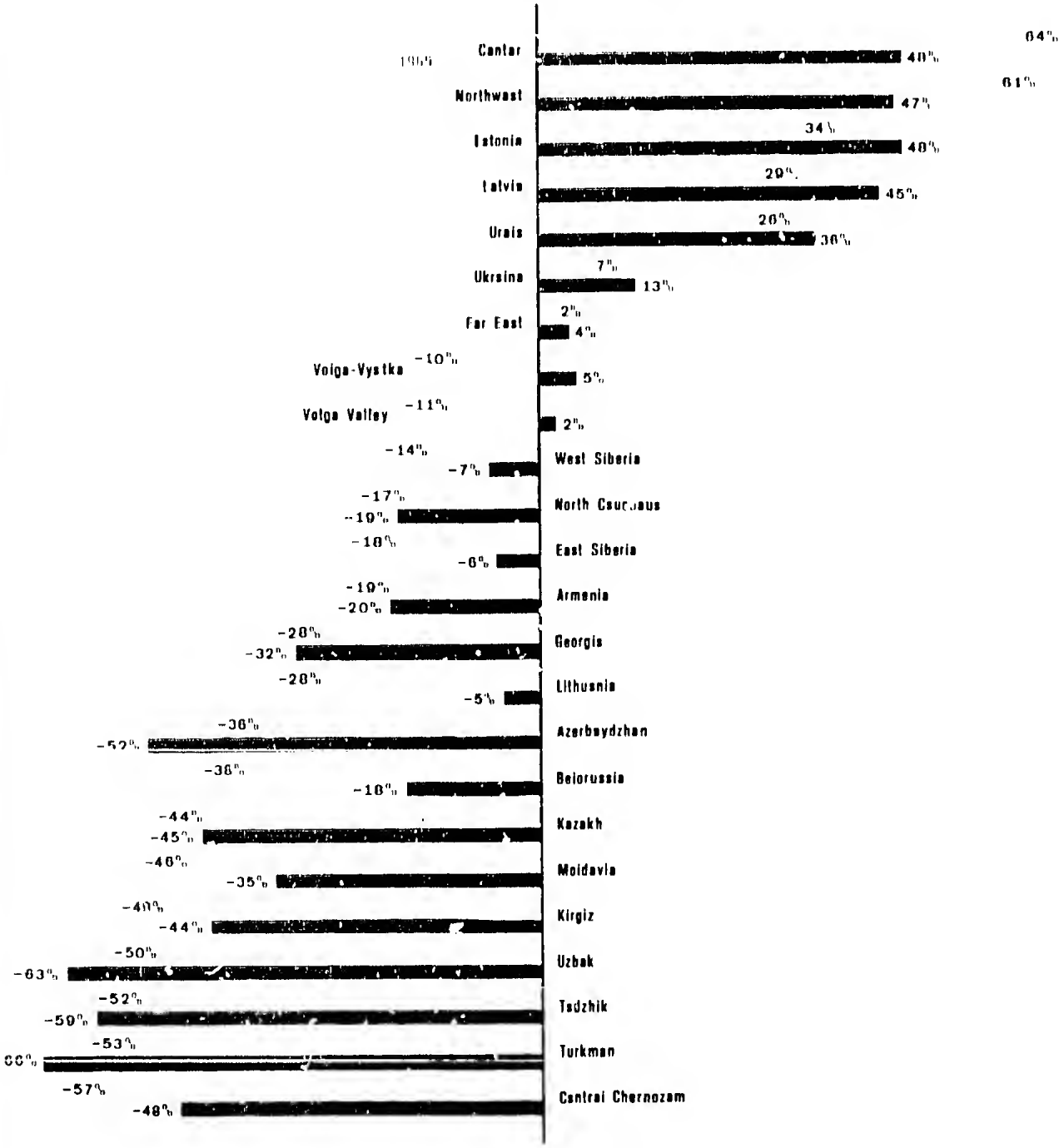
Figure 5

USSR: Regional Gaps in Per Capita Industrial Production

(Percent Above or Below Soviet Average)



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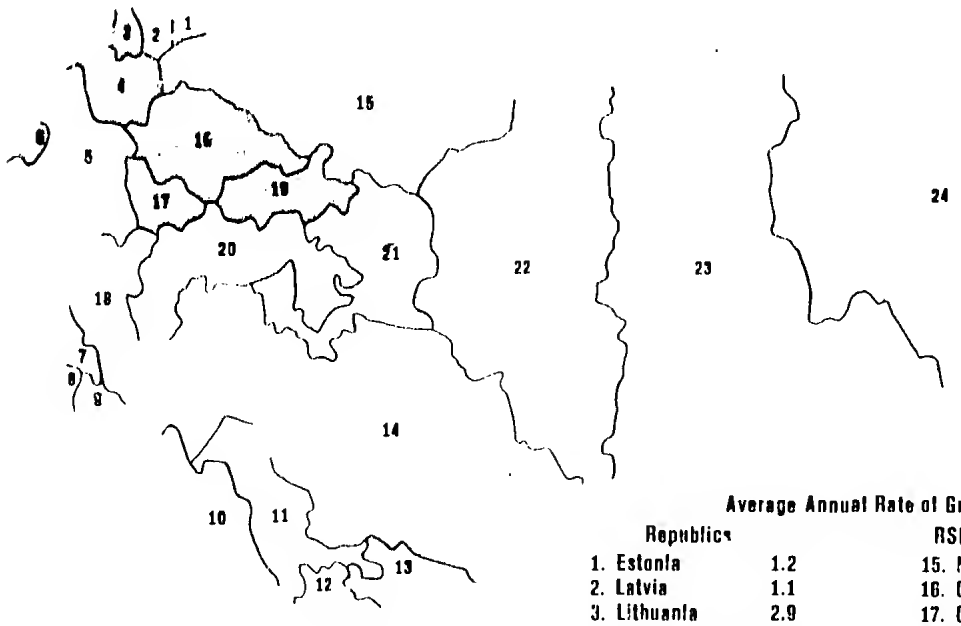
USSR: Regional Variations in Average Annual Growth of Per Capita Agricultural Production, 1961-69*

Figure 6

All-Union Average 1.6% per Year



Significantly above average (more than 2.1% per year)

Average growth (1.1% to 2.1% per year)

Significantly below average (less than 1.1% per year)

*Source: Appendix Table A-1.

Average Annual Rate of Growth (%)

Republics		RSFSR Economic Regions	
1. Estonia	1.2	15. Northwest	1.3
2. Latvia	1.1	16. Center	2.5
3. Lithuania	2.9	17. Central Chernozem	3.8
4. Belorussia	3.1	18. North Caucasus	0.5
5. Ukraine	1.8	19. Volga-Vyatka	2.9
6. Moldavia	3.7	20. Volga Valley	2.1
7. Georgia	2.1	21. Urals	1.8
8. Armenia	−1.0	22. West Siberia	0.4
9. Azerbaydzhan	−1.0	23. East Siberia	0.7
10. Turkmen	1.8	24. Far East	1.0
11. Uzbek	−0.7		
12. Tadzhik	−Negl.		
13. Kirgiz	1.1		
14. Kazakh	9.3		

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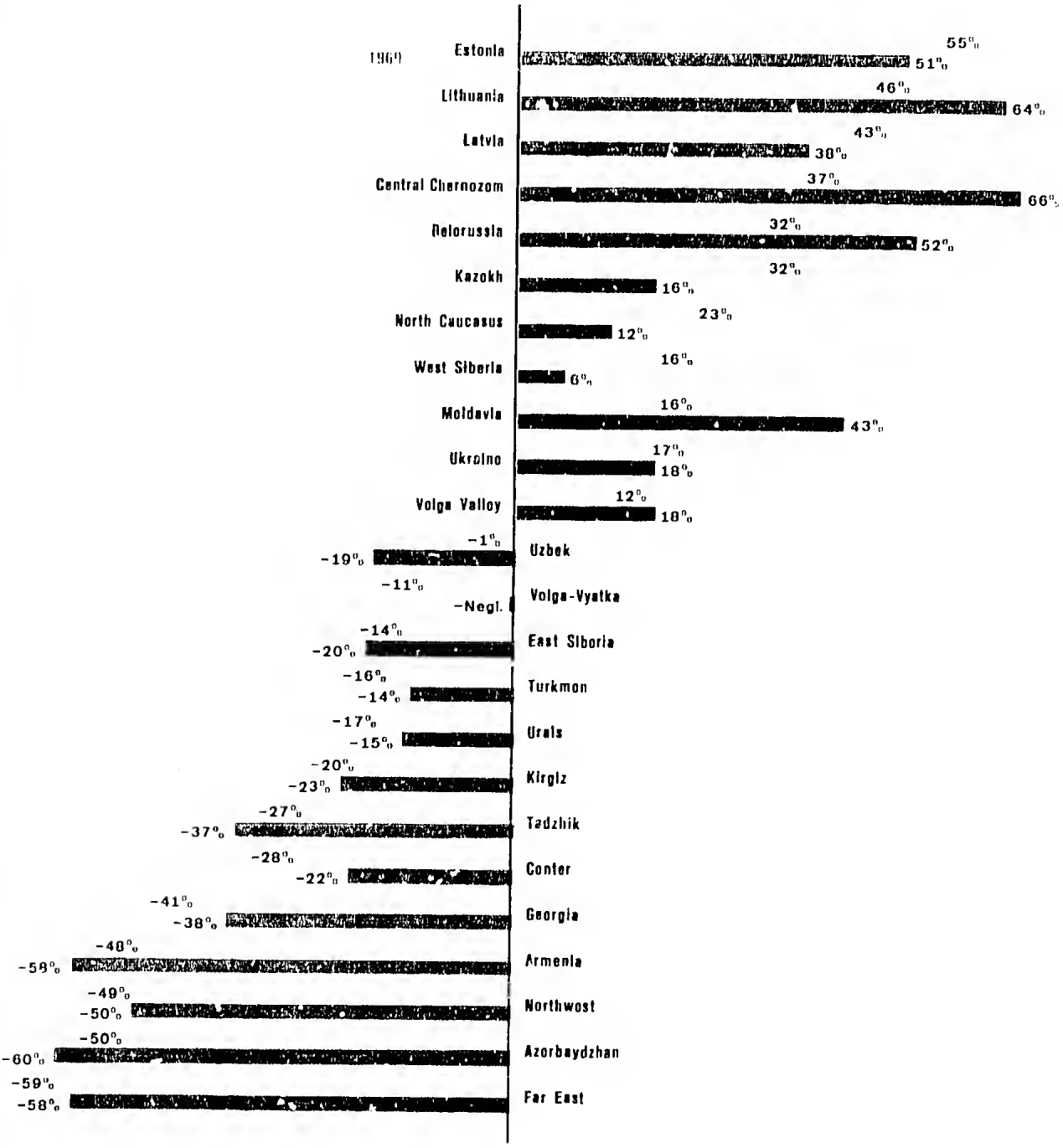
Figure 7

USSR: Regional Gaps in Per Capita Agricultural Production

(Percent Above or Below Soviet Average)



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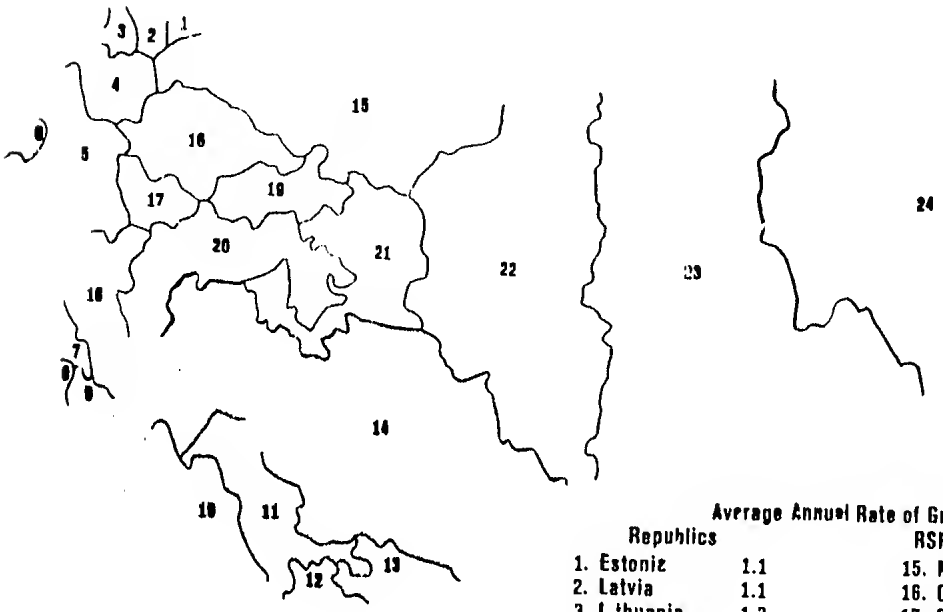
USSR: Regional Variations in Population Growth, 1961-69*

All-Union Average = 1.3% per Year

Figure 8



Significantly above average (more than 1.8% per year)

Average growth (0.8% to 1.8% per year)

Significantly below average (less than 0.8% per year)

*Source: Appendix Table A-1.

Average Annual Rate of Growth (%)

Republics		RSFSR Economic Regions	
1. Estoniz	1.1	15. Northwest	1.0
2. Latvia	1.1	16. Center	0.5
3. Lithuania	1.3	17. Central Chernozem	0.2
4. Belorussia	1.0	18. North Caucasus	1.8
5. Ukraino	1.0	19. Volga-Vyatka	Negl.
6. Moldavia	1.3	20. Volga Valley	1.2
7. Georgia	1.4	21. Urals	0.6
8. Armenia	3.0	22. West Siberia	0.6
9. Azerbaydzhan	3.0	23. East Siberia	1.2
10. Turkmen	3.2	24. Far East	1.9
11. Uzbek	3.6		
12. Tadzhik	3.6		
13. Kirgiz	3.3		
14. Kazakh	2.7		

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Table 2

USSR: Rates of Natural Population Increase, by Republic and Region[a]

Per 1,000

	1960	1970
Turkmen	35.9	28.6
Tadzhik	28.4	28.3
Uzbek	33.9	28.0
Kirgiz	30.8	23.1
Azerbaydzhan	36.0	22.5
Kazakh	30.7	17.3
Armenia	33.3	17.0
Moldavia	22.8	12.0
Georgia	18.2	11.9
Far East	18.7	10.3[b]
East Siberia	20.9	10.1[b]
North Caucasus	16.8	9.1[b]
Lithuania	14.7	8.7
Belorussia	17.8	8.6
Volga Valley	18.0	8.0[b]
West Siberia	19.8	7.6[b]
Urals	17.8	7.3[b]
Ukraine	13.6	6.3
Volga-Vyatka	16.6	5.8[b]
Northwest	13.1	4.9[b]
Estonia	6.1	4.7
Central Chernozem	14.1	4.1[b]
Latvia	6.7	3.3
Center	10.7	3.1[b]
USSR	17.8	9.2
RSFSR	8.9	5.9

[a] Narodnoye khozyaystvo SSSR v 1967 godu, pp. 40-41; v 1970, pp. 50-51.
[b] 1967.

These wide variations in rates of natural increase resulted primarily from large regional differences in birth rates, as death rates varied relatively little among the regions. In Central Asia, for example, where the urbanization process is a relatively recent phenomenon, birth rates were the highest in the country—more than double the rate in the RSFSR—while death rates were slightly lower than in the RSFSR.

In addition to the usual "urban/rural" and "developed/less developed" reasons, inherent differences in the cultural outlook of different nationalities, particularly between the Slavs at one extreme and the Turkic peoples at the other, have undoubtedly been a source of disparate birth rates among the regions. For example, according to a recent survey on family size conducted by the Central Statistical Administration,[19] the number of children considered "ideal" among married women varied from two to three in the European republics and throughout the RSFSR, to from three to five in the republics of Central Asia and Transcaucasia. Even more striking is the fact that the percentage of women who consider six or more children "ideal" is significantly greater in the Central Asian and Transcaucasian republics than in any other region of the country. In all regions, the number of children actually anticipated by the families in the survey was slightly less than the number considered "ideal," ranging from two in the European areas and the RSFSR to three to four in Central Asia and Transcaucasia. These differences in attitudes regarding family size reflect, among

[19] The survey was conducted in 1969 and the results published in an article by Belova, V., "Obsledovaniye mnenii o nailyuchshem i ozhidayemom chisle detey v sem'ye," Vestnik statistiki, no 6, 1971, pp. 23-34.

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other things, regional variations in the average age at marriage. The average age of newly married couples in the RSFSR is currently 29+ for men and 27+ for women and increasing, but in Central Asia the average age is in the low 20s and stable. It is not surprising, therefore, that the natural rate of population increase is now as much as four times greater in the Central Asian republics as in the RSFSR as a whole.

Every region except the Tadzhik Republic shared in the remarkable decline in rates of population growth that occurred in the 1960s. The general fall in rates of natural increase, however, did not disturb appreciably the substantial regional differences that existed in 1960.

Migration

Usually, migration of population acts to reduce regional disparities in population growth and income levels—that is, people move out of regions of high rates of population growth and low incomes into regions of lower population growth and high incomes. This pattern was most notable in the Baltic republics of Latvia and Estonia, where in-migration was the dominant source of population growth, and in Azerbaydzhan, the only area of high population growth that experienced a net out-migration during this period (see Table 3).

Table 3

USSR: The Contribution of Natural Increase and Migration to Population Growth, by Region
1960-70

	Net Percentage Change in Population	Percentage Change Due to Natural Increase [a]	Percentage Change Due to Migration [b]
			Out-migration
Central Chernozem	3	11	−8
Volga-Vyatka	1	7	−6
West Siberia	8	14	−6
Urals	7	13	−6
Belorussia	12	15	−3
Georgia	16	18	−2
East Siberia	15	17	−2
Azerbaydzhan	38	39	−1
Center	8	9	−1
Northwest	12	12	Negl.
			In-migration
Turkmen	42	42	Negl.
Volga Valley	15	15	Negl.
Ukraine	13	12	1
Lithuania	15	14	1
Moldavia	24	22	2
Far East	20	17	3
Uzbek	45	41	4
Kirgiz	42	36	6
North Caucasus	23	16	7
Latvia	13	6	7
Estonia	13	6	7
Armenia	41	33	8
Kazakh	40	32	8
Tadzhik	46	37	9
USSR	*16*	*16*	*N.A.*
RSFSR	*11*	*12*	*−1*

[a] Change in population that would have resulted from natural rates of increase alone.

[b] Derived by comparing the 1970 census results with the population that would have resulted from natural rates of increase alone.

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On the other hand, migration aggravated regional disparities in natural population growth in most republics—retarding the growth of population in areas with relatively low rates of natural increase and augmenting growth in areas already having relatively high rates of natural increase. Out-migration from the regions of the RSFSR, with the exception of the North Caucasus and the Far East, tended to reinforce the effects of the already relatively low rates of natural increase. This effect was most prominent in the Volga-Vyatka, Central Chernozem, West Siberian, and Urals regions where out-migration reduced the effects of natural population increase by 86%, 73%, 43%, and 46%, respectively. On the other hand, the net migration into the republics of Central Asia and Armenia, where the rates of natural increase were among the highest in the country, had just the opposite effect.

Much of the migration over the last decade has been closely linked to the massive flow of rural residents to urban areas. Nearly one-half the growth of the country's urban population between 1959 and 1970 was due to the migration from rural to urban areas, although the intensity of the rural-urban flow has not been uniform in all regions. In the RSFSR, out-migration from rural areas was approximately double the natural increase in these areas, resulting in an absolute decline in the rural population. The decline was most prevalent in the Central, Volga-Vyatka, Central Chernozem, West Siberian, Northwest, and Urals regions. Within the RSFSR, only the North Caucasus and Far East regions incurred an increase in rural population during this period. On the other hand, in the Central Asian republics the rapidly growing rural population has tended to be considerably less mobile. In fact, Soviet demographers have pointed out that much of the urban population growth in these republics has been the result of an influx of people from other regions, notably from West Siberia and the Urals, rather than from their own rural areas. In many cases this has created urban enclaves of Slavic peoples surrounded by rural areas populated by the rapidly growing indigenous ethnic groups.

Thus the economic growth that has taken place in the Central Asian republics in recent years has not been accompanied by a general assimilation of the Turkic peoples into the urban-industrial economy. In the absence of an influx of workers from other regions, economic growth in these republics might well have been less, but a continuation of this pattern would enhance the colonial image that the central government has been trying to shed in these regions and limit the opportunities for drawing the indigenous population into more advanced industrial processes.

Practices followed in [illegible]ing labor, particularly highly skilled labor, do little to alleviate this [illegible]ition. Students holding post-graduate degrees are generally assigned to remote areas for a period of three years following completion of their studies. Many of these specialists avoid such duty through one or another loophole in the regulations. However, most of those who are unable to avoid a remote work assignment settle afterwards in other regions, notably in the larger urban areas such as Moscow and Leningrad, or in the southern cities where the warmer climate provides considerable incentive after three years in the harsh northern or eastern regions. This attraction of skilled labor to the southern regions is reinforced by Soviet wage policy. Regional wage differentials, designed to attract and retain labor in the more remote or climatically severe regions (especially Siberia and the Far East), are insufficient to counter the attraction of the southern cities. Consequently, skilled laborers are pulled into the urban areas of Central Asia, where they are warmly received by employers who would rather hire Slavs than the generally less well trained Turkic people at the same rates of pay.

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The rapid population growth in the less developed regions was accompanied by a somewhat slower growth of population of working age (see Table 4); able-bodied population in the Central Asian republics grew about 20%-30% between 1960 and 1970 (compared with a population growth of about 40%) because of low population growth in the early 1950s. However, in 1970-80 the able-bodied population will surge because of the high birth rates of 1960-70. Hence, the problem of finding work for rural minority group labor will become even more acute in the 1970s.

Table 4

USSR: Index of Growth of Able-Bodied Population, by Republic[a] 1960-70

	1959 = 100
Kazakh	131
Armenia	131
Kirgiz	129
Uzbek	124
Tadzhik	123
Turkmen	123
Moldavia	119
Azerbaydzhan	118
Estonia	111
Latvia	109
Lithuania	109
Georgia	109
Belorussia	107
RSFSR	106
Ukraine	105

[a] Males between 16 and 60 years of age and females between 16 and 54 years of age. Based on 1970 census data reported in the regional press.

REGIONAL INVESTMENT POLICY

According to all the measures discussed above, the differences among regions with respect to per capita income and output widened rather than narrowed during the 1960s. The other major factors determining growth of income and output, apart from population growth, are investment allocations, by region, and the return on investment, by region.

Inconsistency Between Regional Policy and Investment Allocations

The professed official policy of favoring the less developed regions is not borne out by the pattern of investment allocations. Per capita new fixed investment in 1960-69 has not favored consistently those republics that had the lowest national income per capita in 1960[20] (see Figure 9).

Although some of the poorer republics—notably the Kazakh and Turkmen Republics—received more investment funds per capita than the richer republics,

[20] The Kendall rank order correlation coefficient relating per capita new fixed investment in 1960-69 to per capita regional income in 1960 was 0.410. In other words, there was some positive correlation in the sense that areas with relatively high per capita national incomes in the base year tended to be favored with relatively high per capita investments expressed in rubles. While the relationship did not indicate a strong planners bias in favor of the "rich" republics, the results certainly did not suggest that a policy of giving preference exclusive to the lagging areas was followed. The coefficient would have been −1.00 if investment allocations had been inversely related to income levels with perfect consistency.

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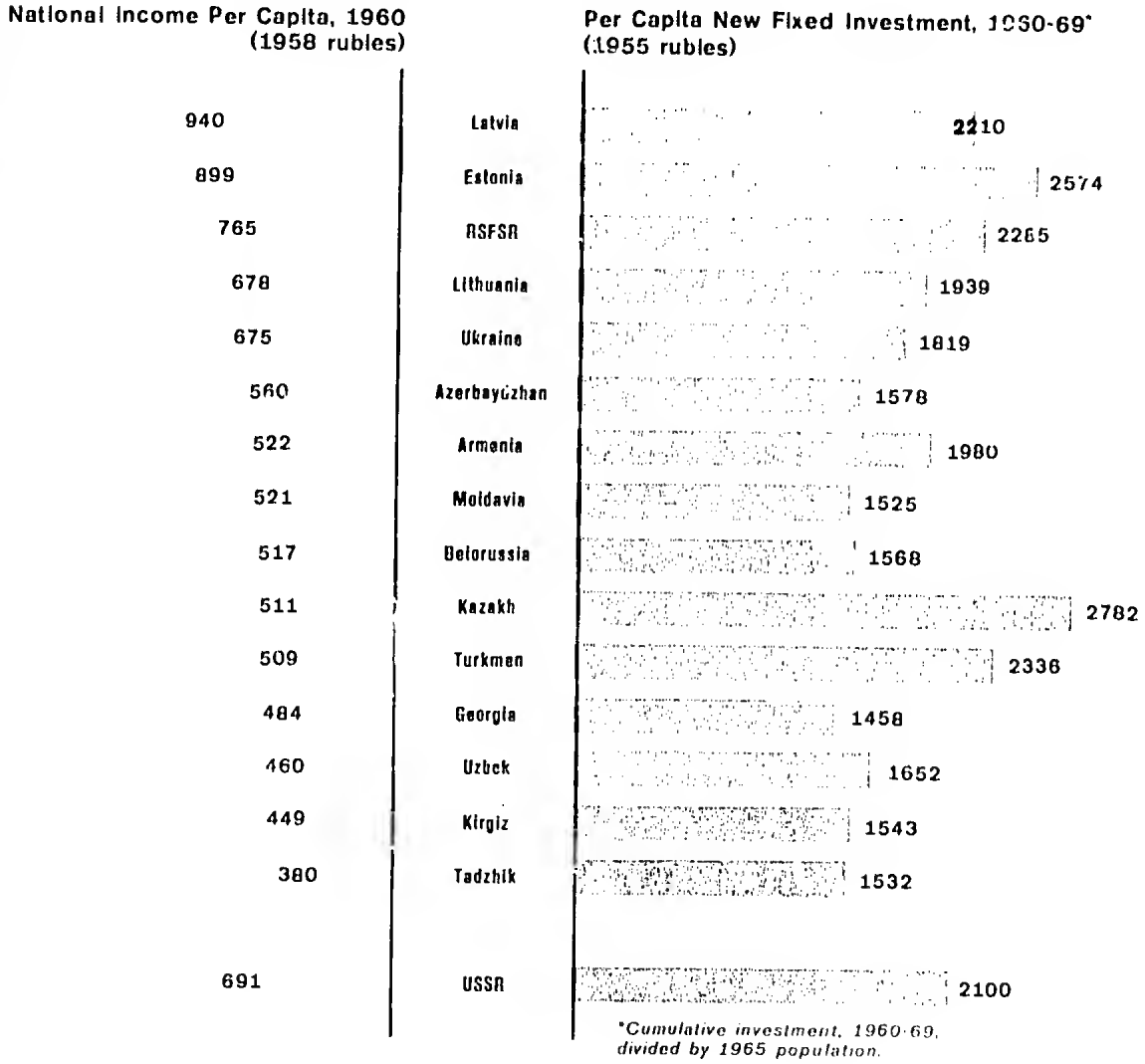
Figure 9

USSR: Ranking of Union Republics, by Per Capita National Income and Per Capita New Fixed Investment



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the Georgian, Kirgiz, and Tadzhik Republics were given investment allocations barely half as large as those funneled into the Kazakh Republic. Moreover, the relatively high investment allocations in the Kazakh and Turkmen Republics were used largely for the exploitation of mineral and fuel deposits. Although Soviet policymakers in making decisions from the center may have considered the regional parity goal, clearly other factors must have tempered this consideration when investment plans were made.

Within the RSFSR, however, per capita investment allocations appear to have favored the less developed eastern regions, particularly East Siberia and the Far East. Throughout most of the 1960s,[21] per capita investment allocations in these regions appear to have been consistently higher than in any other region of the RSFSR or in any other union republic. This may reflect, in part, a planners' preference for developing the eastern regions, though perhaps motivated less by equality considerations and more by a desire to exploit the vast natural resource base in these regions. The high investment allocations to the eastern regions of the RSFSR may also reflect the greater costs incurred in the general development of these regions.

Higher Growth of Productivity in the More Developed Regions

To narrow the differences in regional levels of development significantly, the USSR must fly in the face of the best investment opportunities. Increases in industrial production are becoming relatively more expensive to achieve in most of the less developed areas of the USSR than in the already developed western regions. One measure of this is the relatively low growth of productivity of inputs of labor and capital in many of the poorer regions.[22]

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[21] Comparable investment data for the regions of the RSFSR were available only for 1960, 1965, 1966, and 1967 in **Narodnoye khozyaystvo SSSR v 1967 godu**, p. 625.

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[22] Although it is usual to consider the incremental capital-output ratios when discussing investment priorities, the growth of combined factor productivity is considered to be a better indicator for the allocation of investment among regions, since it is misleading to suggest that increases in output are due solely to capital accumulation. As G.M. Meier points out,

> Even if we accept the assumption that there is a fixed relationship between capital and output as determined by technical factors, it does not follow that we can infer from this relationship that only capital is needed to increase output. We must also consider explicitly the effect of other variables on output—for example, the supply of trained manpower, entrepreneurship, institutional arrangements, attitudes, etc.

(Meier, **Leading Issues in Development Economics** (2nd Ed.), Oxford University Press, New York, 1970, p. 177.)

Labor and capital inputs were combined in a Cobb-Douglas production function under the assumption that the inputs were paid the value of their marginal products in the base year. For the derivation of production function coefficients, see Appendix B.

The measure of combined factor productivity was derived as the residual element which accounts for that part of the annual percentage increase in output in excess of increases in aggregate inputs—that is,

$$\frac{\Delta A}{A} = \frac{\Delta Q}{Q} - \left[a \frac{\Delta L}{L} + (1-a) \frac{\Delta K}{K} \right]$$

where:

A = Residual (combined factor productivity),
Q = Industrial output,
L = Manhours of labor input,
K = Industrial fixed capital stock,
a and (1−a) = Labor and capital coefficients.

Since it is a residual, combined factor productivity covers the contribution of many factors to the growth of output such as the contribution of management improvements in resource allocation, economies of scale, increases in the skill level of labor, and any other phenomena that may affect the efficiency with which industrial production is carried out.

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Over the past decade, increments to industrial output per unit of combined inputs have grown very little in the less developed republics and in some cases have actually declined (see Table 5). Sluggish growth of combined factor productivity was a particularly significant problem in Uzbekistan, Turkmenia, and Azerbaydzhan, where industrial output grew at rates below the national average despite the above average growth of combined inputs of labor and capital in these republics. In contrast, the Baltic republics, together with Belorussia and the Ukraine, experienced the largest increases in combined factor productivity during the 1960s. Although factor productivity in Georgia grew at the same rate as the national average, a very slow growth of inputs curbed the expansion of industrial production.

Table 5
USSR: Combined Factor Productivity in Industry

	Absolute Change in Combined Factor Productivity, 1960-69 *		Average Annual Rate of Growth of Factor Productivity, 1961-69		Average Annual Rate of Growth of Combined Inputs, 1961-69	
	Rubles of Output per Unit of Combined Inputs	Rank	Percent	Rank	Percent	Rank
Latvia	1.33	1	3.4	2	5.5	12
Estonia	1.30	2	3.5	1	5.6	13
Belorussia	1.06	3	2.8	3	8.4	7
Ukraine	0.87	4	2.3	5	6.2	11
Lithuania	0.85	5	2.4	4	9.3	2
Georgia	0.81	6	2.2	6	5.4	15
Kirgiz	0.79	7	2.1	8	9.3	3
RSFSR	0.63	8	2.2	7	5.6	14
Moldavia	0.55	9	1.2	9	10.0	1
Armenia	0.31	10	0.9	10	9.1	4
Kazakh	0.15	11	0.6	11	9.1	5
Azerbaydzhan	0.02	12	0.1	12	6.6	10
Tadzhik	0.0	13	0.1	13	8.8	6
Uzbek	0.131	14	0.4	14	7.6	9
Turkmen	0.21	15	1.0	15	7.8	8
USSR	0.66		2.2		6.0	

* Derived as: $\frac{Q_t}{L^{\alpha}_{t} K^{1-\alpha}_{t}} - \frac{Q_o}{L^{\alpha}_{o} K^{1-\alpha}_{o}}$

This pattern of productivity growth is not particularly surprising. Favorable factors for growth are usually available in areas of considerable urban-industrial development. Therefore, given an existing spatial distribution of urban-industrial development, this distribution could be expected to exert a significant influence on the regional pattern of productivity growth.[23] The reason is that

[23] Differences in the industrial structures of the republics may also account for some of the regional differences in productivity growth—that is, if output per unit of combined inputs grows faster in some branches of industry than in others, then regions in which the faster growing branches predominate might show a higher rate of growth of overall factor productivity. Koropeckyj attempts to deal with this problem by analyzing the productivity of various industrial branches in most of the republics over the period 1958-65 (Koropeckyj, "Industrial Location Policy," op. cit., pp. 290-295). Although his results show a relatively higher growth of total factor productivity for some of the less developed republics, Koropeckyj's evidence is based on average annual rates of change covering a different time period than that covered in this paper. Moreover, the time period examined by Koropeckyj was not consistent for all republics, and the data appear to require very broad assumptions with respect to comparability and the problem of matching the coverage of inputs and output.

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growth proceeds more easily in or near already established urban industrial centers due to agglomeration economies—that is, economies arising from the concentration of economic activities in a given area. That such economies are not trivial can be seen in the continued expansion of industry in the largest metropolitan areas, despite official emphasis on developing the smaller urban areas.[24] First of all, it generally requires less time and money to improve and expand existing facilities and to bring new plants to full capacity operation in regions that are already well developed than it does to build new facilities (including the associated social overhead) in the less developed regions. Also, it is easier to assimilate technological and managerial innovations into the mainstream of industrial production in the already highly developed regions. Thus it is not surprising that the European regions of the country, in which most of the urban-industrial development is concentrated, show the highest growth rates of combined factor productivity. There is not much evidence to suggest that diseconomies resulting from overcrowding and rising costs of social utilities as yet outweigh the economies of urban agglomerations.[25]

IMPLICATIONS FOR SOVIET POLICY

Investment Allocations

The regional trends examined in this paper confront Soviet planners and political leaders with a policy dilemma. A significant reduction of regional income differentials and maximum national economic growth cannot be achieved simultaneously through investment strategy alone. If maximum national economic growth is to be the chief criterion for allocating investment, then capital should be directed primarily toward those regions in which it is most productive. But, as the data on factor productivity in industry suggest, these are not the same regions in which heavy investment allocations would be consistent with a policy oriented toward achieving regional parity in income. Only with the help of migration policy could all regions move toward income parity, since the most rapid population growth is occurring in those regions with the lowest income growth. Significantly increasing the development of labor-intensive branches of industry in the less developed regions, to utilize their rapidly growing supply of "warm bodies" of working age, is not likely to be a viable substitute for out-migration of labor. Much of the growth of able-bodied population in these regions consists of unskilled rural residents whose social and cultural habits inhibit vocational transitions.

Therefore, given the distribution of opportunities, it is not surprising that Soviet investment patterns have not favored consistently those republics with low per capita national income in 1960. On the other hand, the evidence is not

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[24] For instance, the Lithuanian Council of Ministers recently reported that industrial development continues to expand much more rapidly in the cities of Vilnius and Kaunas, which already accounted for over one-half of Lithuania's industry in 1960, than in the small and medium-size cities of the republic, despite official pleadings to the contrary. (Izvestiya, 13 Jul 1971, p. 3.)

[25] As one author puts it,

> The continued growth of even the largest metropolitan regions in the world contradicts the expectation of diminishing marginal returns to scale . . . there is no evidence that metropolitan areas have ceased to grow anywhere as the result of presumed social diseconomies. (Friedman, J., **Regional Development Policy: A Case Study of Venezuela**, MIT, Cambridge, 1966, pp. 14-15.)

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strong that productivity was the guiding principle for investment allocations.[26] However, this may reflect the lack of any clear-cut methodology and agreed upon economic criterion for implementing optimum investment policy (not to mention usable price data), particularly with respect to industrial location, rather than the lack of a priority goal for example, maximizing production.[27] Both Soviet and Western literature on this subject have repeatedly noted the arbitrary and inconsistent methods of arriving at location decisions in the USSR and the contradictory criteria often used to justify such decisions.[28]

Since the Soviets have been unable to implement an investment policy designed to achieve both regional parity and maximum production simultaneously, it appears from the evidence at hand, albeit weak, that actual investment policy may have leaned more toward the latter insofar as planners could determine. While this would be consistent with the principle of moving capital resources to the place where they contribute most to production, it cannot solve the problem of regional national income differentials. An optimum policy for moving toward regional parity must combine some capital investment (particularly educational capital) in the less developed regions with out-migration of labor from these regions. However, no significant efforts have been made over the past decade either to stem the flow of migration into Central Asia and the Transcaucasus or to shift labor from these areas to other parts of the USSR.

Migration Policy

While more stringent control over migration into the less developed regions is a clear possibility for the future, the problem of what to do about the rapidly increasing indigenous population remains. Forced out-migration, though possible, does not seem to be a likely course of action. Aside from the fact that the Turkic population may be unwilling to move and the "host" Slavic population unreceptive to such movement, the educational and language constraint that prevents most of the Turkic population from entering the skilled labor force, together with the orientation of these people toward irrigation agriculture, warm climates, and large families, makes it unlikely that they could readily adapt to the living conditions and vocational demands in either the European or Siberian regions of the country. Moreover, the facilities to accommodate such in-migrants are sorely lacking throughout these regions. Housing would provide a particularly troublesome problem as well as a potential source of friction between the Slavic population and the newcomers, since it is already in short supply and not generally suited to the traditionally large families of the Turkic peoples.

Difficult though it may be, out-migration from the less developed regions may have to be encouraged, and properly accommodated, if the Soviets want to

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[26] Industrial investment in 1961-69 has not favored consistently those republics with high levels of industrial factor productivity in 1960. The Kendall rank order correlation coefficient relating the average annual growth of industrial new fixed investment in 1961-69 to the level of industrial factor productivity in 1960 was 0.048. The coefficient relating the average annual growth of combined inputs of labor and capital in 1961-69 to the level of industrial factor productivity in 1960 was 0.162.

[27] Defense considerations may also weigh heavily in investment decisions, although in a nuclear age it seems likely that these considerations would be more consistent with maximizing production than with creating regional parity. The relatively large investment allocations to some of the less developed republics in Central Asia no doubt reflect the exploitation of natural resources at least as much as the implementation of any specific defense measures.

[28] Vsevolod Holubnychy has prepared an excellent summary and bibliography on this point in **Spatial Efficiency in the Soviet Economy**, a paper delivered at the AEA-ASSTE meeting in New Orleans on 28 December 1971.

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avoid, in these regions, a buildup of minority nationalities of relatively low income. At the very least (as in the case of Italy), the movement of indigenous labor from rural areas to selected urban industrial growth centers within these regions will have to be increased. However, this would require halting the flow of Slavic in migrants to these regions, which, as already noted, may prove difficult without significant changes in current wage policy.

Plans for 1971-75

The 1971-75 plan indicators, by union republic, suggest that past development patterns will not change radically over the next five years. The planned growth of national income in each republic, shown in Table 6 below, is one piece of evidence. The most rapid growth is planned for Moldavia, Belorussia, Armenia, and Lithuania, followed by the Turkic republics of Uzbekistan, Kazakhstan, and Azerbaydzhan. This growth, if attained, would represent a relative improvement in the position of Uzbekistan and Azerbaydzhan—republics which grew at below-average rates during the 1960s. On a per capita basis, however, much of this planned improvement may be offset by continued high population growth.

In the agricultural sector, the biggest percentage increase in production during 1971-75 (compared with 1966-70) is slated for Moldavia, where per capita production during the 1960s was already above the national average. Although above-average increases are also planned for Azerbaydzhan, Armenia, Tadzhikistan, and Georgia, it is not likely that these increments will go far toward bringing these republics up to the national average, particularly if no major changes occur in the regional pattern of population growth.

The regional pattern of growth in industry planned for 1971-75 is quite similar to that planned for 1966-70—that is, the most rapid growth is slated generally for the less developed republics.[20] Based on past performance, some of these republics, particularly the Turkmen and Uzbek Republics, probably will fall short of the planned growth. The likelihood of such shortfalls becomes even greater when one considers that the planned growth of industrial output must be achieved through significant increases in productivity rather than by large increments to inputs. This indication of a growing pinch on available resources has been emphasized by the Soviet leadership and is mirrored in the plan data for increases in total capital investment by republics.

The regional plans also suggest that investment per capita in most of the minority national republics will probably grow somewhat slower than during 1966-70 or, at best, maintain the same rate of growth. Only in Azerbaydzhan is the 1971-75 planned increase in per capita investment significantly greater than that achieved during 1966-70. The scheduled reductions in per capita investment growth rates are especially steep in the Lithuanian, Belorussian, Armenian, and Uzbek Republics. Despite these changes in growth rates, the largest investment allocations per capita will continue to go to the same five republics during 1971-75 as during 1961-65 and 1966-70—Estonia, Turkmenia, Latvia, the RSFSR, and Kazakhstan (see Figure 10). Thus it appears that no major shift in the regional distribution of per capita investment is contemplated.

[20] Although plan data for the economic regions of the RSFSR are almost nonexistent, the planned growth of industrial production in Siberia and the Far East is reported to be above the national average.

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Table 6

USSR: Planned Growth, by Republic

	1975				1971–75 Agricultural Production [c]		Percentage Increase in Per Capita New Fixed Investment over Previous 5 Years			
	National Income [a]		Industrial Output [b]				1966–70		1971–75	
	1970=100	Rank	1970=100	Rank	Percent [c]	Rank	Actual [d]	Rank	Planned [e]	Rank
Moldavia	151	1	162	3	36	1	46	3	45	1
Belorussia	147	2	158	5	25	6	62	1	45	2
Armenia	146	3	164	1	32	3	37	7	36	14
Lithuania	144	4	149	8	16	15	60	2	38	8
Uzbek	142	5	151	7	24	7	46	4	42	13
Kazakh	142	6	159	4	22	8	42	5	42	11
Azerbaydzhan	142	7	146	10	35	2	45	6	43	7
Latvia	141	8	140	13	19	13	38	8	36	14
Kirgiz	140	9	155	6	20	10	31	11	31	15
RSFSR	140	10	147	9	22	9	32	10	37	9
Ukraine	138	11	143	12	19	14	29	12	31	15
Turkmen	137	12	164	2	20	11	37	7	32	9
Tadzhik	136	13	135	14	28	4	19	13	29	12
Georgia	132	14	144	11	27	5	41	5	40	5
Estonia	N.A.	.....	138	15	20	12	35	9	35	6
USSR	139	.....	147	.....	22	.....	31	.....	38	.....

[a] **Ekonomicheskaya gazeta**, nos. 51 and 52, Dec 1971; Belorussian Plan from Summary of World Broadcasts, part I, 14 Jan 1972.

[b] **Izvestiya**, 25 Nov 1971.

[c] Percentage increase in the average annual volume of agricultural production in 1971–75 over 1966–70.

[d] Derived from annual gross fixed investment data as reported in **Narodnoye khozyaystvo SSSR v 1969 godu**, p. 509, **v 1967**, p. 623, **1965**, p. 585, **v 1963**, p. 457. Investment data for 1970 were obtained from plan fulfillment reports published in **SSSR i soyuznyye respubliki v 1970 godu** Moscow, 1971.

[e] Data were derived from a variety of regional press and reports of foreign broadcasts, and are based on 1955 prices.

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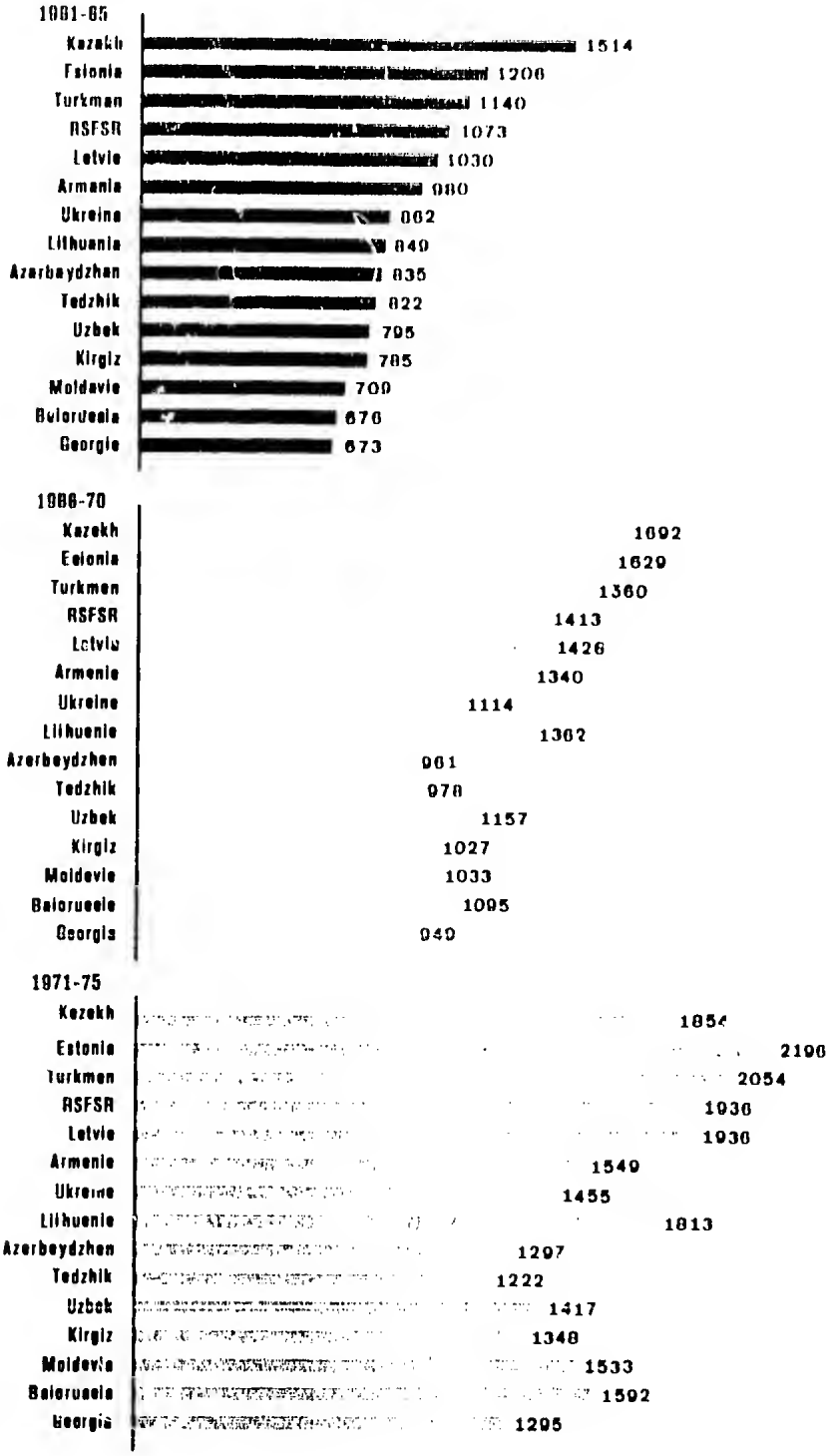
Figure 10

USSR: Per Capita New Fixed Investment, by Republic

(1955 rubles)



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Similarly, no new policies with respect to interregional labor transfers have been announced. Emphasis remains primarily on wage differentials as an incentive for labor to migrate into the Siberian regions. However, this policy has enjoyed only minor success for Siberia in the past. In fact, the lack of sufficient regional wage differentials, as discussed earlier, has drawn labor into the southern regions. Although there has been some recognition of the need to increase these wage differentials, it is unlikely that any immediate increases will promote a significant transfer of labor to Siberia and the Far East during the next five years.

Since the new five-year plan gives no prospect of reducing regional income differentials by a coordinated redistribution of both capital and labor, regional disparities in development levels are likely to persist with little change during the new plan period. In fact, if industrial growth must depend primarily on increases in factor productivity, the development gaps may continue to increase, with the less developed republics falling still further behind the rest of the country.

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APPENDIX A

PRIMARY DATA USED IN CALCULATING REGIONAL TRENDS IN PER CAPITA NATIONAL INCOME, INDUSTRIAL AND AGRICULTURAL OUTPUT, AND FACTOR PRODUCTIVITY

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Table A–1

USSR: Indexes of Regional Growth

1969=100

	Mid-Year Population [a]		National Income [b]			Industrial Output [c]			Agricultural Production [d]		
				1969			1969			1969	
	1965	1969	1965	Total	Per Capita	1965	Total	Per Capita	1965	Total	Per Capita
Northwest [e]	106.0	109.2				138	182	167	112.7	122.4	112
Center	102.5	105.0				131	174	166	113.5	130.6	124
Central Chernozem	101.5	101.5				163	227	224	123.7	141.0	139
Volga-Vyatka	100.0	100.3				145	213	212	106.6	129.5	129
Volga Valley	107.5	111.5	135	181	168	161	233	209	115.7	133.6	120
North Caucasus	110.4	117.3				154	210	179	124.5	122.4	104
Urals	103.6	105.1				148	203	193	101.1	123.9	118
West Siberia	105.0	105.5				150	209	198	98.9	109.3	104
East Siberia	108.3	111.2				161	232	209	112.9	118.0	106
Far East	111.7	118.3				159	222	188	116.1	139.0	117
Estonia	105.3	110.0	143	191	174	160	222	202	112.4	122.9	112
Latvia	105.7	110.0	141	156	161	158	226	205	108.2	121.9	111
Lithuania	106.7	112.0	152	223	199	174	273	244	123.4	144.6	129
Belorussia	104.9	109.4	141	200	183	164	263	240	126.6	143.9	132
Ukraine	105.9	109.7	140	184	168	153	211	192	115.3	126.2	115
Moldavia	111.2	118.4	161	212	179	177	261	220	135.5	164.7	139
Georgia	108.5	112.9	137	173	153	141	196	174	117.7	136.0	120
Armenia	116.3	130.5	148	208	159	157	237	182	108.0	119.6	92
Azerbaydzhan	117.6	130.0	125	152	117	141	178	137	108.8	119.8	92
Kazakh	119.0	127.6	131	193	151	164	231	181	119.1	130.4	102
Kirgiz	119.4	134.1	150	200	149	167	267	199	136.1	147.8	110
Uzbek	120.9	138.0	145	172	125	150	186	135	119.2	129.4	94
Tadzhik	121.9	138.1	156	189	137	154	211	153	128.5	137.4	99
Turkmen	118.1	132.8	131	155	117	134	177	133	132.6	156.2	118
USSR	107.6	112.1	137	183	163	149 [f]	205 [f]	183	115.5	128.9	115

[a] Indexes of mid-year population were derived from data in Table A–3.

[b] Indexes of national income were taken from **Narodnoye khozyaystvo SSSR v 1969 godu,** p. 558.

[c] Indexes of industrial output were taken from **Narodnoye khozyaystvo SSSR v 1969 godu,** p. 149.

[d] Indexes of agricultural production and the per capita ruble data (shown in Table A-2) were derived from three-year moving averages, representing an estimated net value of per capita agricultural production in the various regions. The value of agricultural output was derived for each region and for the USSR on the basis of price (1968 prices) and quantity data for the following 17 agricultural products: grain, potatoes, other vegetables, fruits and berries, cotton, sugar beets, sunflower seeds, fiber flax, tea, meat, milk, wool, eggs, cattle, hogs, sheep, and goats. An adjustment was made for grain and potatoes used for feeding purposes.

[e] Including Kaliningrad Oblast'.

[f] The index of industrial production for the USSR is based on the sum of the regional values of industrial output in 1965 and 1969.

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Table A–2

USSR: Regional Per Capita Values of National Income, Industrial Output, and Agricultural Production

Rubles

	National Income [a]		Industrial Output [b]		Agricultural Production [c]	
	1960	1969	1960	1969	1960	1969
Northwest [d]	765	1,282	1,167	1,945	124	139
Center			1,185	1,964	176	219
Central Chernozem			311	695	335	465
Volga-Vyatka			653	1,387	217	280
Volga Valley			645	1,347	274	329
North Caucasus			600	1,074	300	313
Urals			930	1,797	203	239
West Siberia			621	1,230	288	298
East Siberia			594	1,236	210	223
Far East			737	1,383	99	117
Estonia	899	1,561	971	1,961	378	423
Latvia	940	1,590	933	1,913	348	386
Lithuania	678	1,350	519	1,264	356	459
Belorussia	517	945	451	1,085	323	425
Ukraine	675	1,131	775	1,492	285	327
Moldavia	521	933	393	867	287	400
Georgia	484	741	522	906	144	174
Armenia	522	831	584	1,060	128	118
Azerbaydzhan	560	655	461	631	123	113
Kazakh	541	773	403	730	321	328
Kirgiz	449	670	369	735	195	215
Uzbek	460	574	359	484	241	226
Tadzhik	380	520	352	537	178	177
Turkmen	509	594	340	453	205	241
USSR	691	1,127	724	1,325	244	280

[a] Prices in 1958. The per capita data for national income shown here and in Table 1 of the text were derived as follows. First, national income per capita for the USSR was derived for 1965 by moving the 1958 value of national income forward by the appropriate growth indexes and dividing by mid-year 1965 population (**Narodnoye khozyaystvo SSSR v 1960 godu**, p. 152 and **Narodnoye khozyaystvo SSSR v 1969 godu** p. 558). Republican data on national income per capita as a percent of the USSR in 1965 (at 1958 prices) contained in Vedishchev, **op. cit.**, p. 82, were then applied to the USSR figure. From these results, national income was derived for each republic in 1965, and the latter was moved back to 1960 and forward to 1969 by the appropriate growth indexes (**Narodnoye khozyaystvo SSSR v 1969 godu**, p. 558). Finally, using mid-year population data (Table A–3), per capita national income was calculated for each republic in 1960 and 1969.

[b] Prices in 1955. The per capita data for industrial output shown here and in Table 1 of the text were derived from the gross value of industrial output for the USSR in 1960 at 1955 prices (**Promyshlennost' SSSR**, Moscow, 1964, p. 36), and the regional percentage shares of this total figure (originally derived in Cook, P. K., "The Administration and Distribution of Soviet Industry," in US Congress, Joint Economic Committee, **Dimensions of Soviet Economic Power**, Washington, 1962, pp. 704–732, and later adjusted for boundary changes in Karopeckyj, "Industrial Location Policy," **op. cit.**, pp. 286–287).

[c] Prices in 1968. Data for agricultural production were derived as explained in footnote d for Table A–1.

[d] Including Kaliningrad Oblast'.

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Table A–3

USSR: Mid-Year Population [a]

Thousand Persons

	1960	1965	1969
Northwest [b]	11,676	12,371	12,752
Center	25,936	26,584	27,234
Central Chernozem	7,848	7,968	7,964
Volga-Vyatka	8,290	8,290	8,318
Volga Valley	16,371	17,592	18,260
North Caucasus	12,080	13,340	14,172
Urals	14,498	15,206	15,232
West Siberia	11,526	12,108	12,158
East Siberia	6,666	7,220	7,412
Far East	4,907	5,482	5,806
Estonia	1,215	1,279	1,336
Latvia	2,130	2,252	2,344
Lithuania	2,781	2,968	3,116
Belorussia	8,184	8,583	8,950
Ukraine	42,786	45,308	46,944
Moldavia	3,001	3,336	3,552
Georgia	4,161	4,515	4,699
Armenia	1,860	2,164	2,428
Azerbaydzhan	3,904	4,591	5,076
Kazakh	10,078	11,988	12,864
Kirgiz	2,185	2,610	2,930
Uzbek	8,564	10,350	11,816
Tadzhik	2,073	2,528	2,862
Turkmen	1,598	1,888	2,122
USSR	214,318	230,521	240,347

[a] Derived from data reported in Narodnoye khozyaystvo SSSR v 1960 godu, p. 8; v 1964, p. 12; v 1968, p. 12; v 1969, p. 12; and Narodnoye khozyaystvo RSFSR v 1960 godu, pp. 34-37.

[b] Including Kaliningrad Oblast'.

Table A–4

USSR: Indexes of Growth of Man-Hours Worked per Year in Industry [a]

1960 = 100

	1965	1969
RSFSR	117.5	140.0
Estonia	126.5	146.6
Latvia	125.9	153.7
Lithuania	146.9	203.1
Belorussin	137.2	189.9
Ukraine	124.3	155.6
Moldavia	150.5	216.0
Georgia	121.6	149.7
Armenia	138.4	195.3
Azerbaydzhan	127.6	146.4
Kazakh	137.5	192.8
Kirgiz	138.1	192.9
Uzbek	132.3	164.2
Tadzhik	140.3	181.7
Turkmen	117.7	140.6
USSR	121.2	147.9

[a] Based on employment data, days worked per man-year, and hours worked per man-day. These data were extracted from Trud v SSSR, pp. 40-70, 81, and 173, and Narodnoye khozyaystvo SSSR v 1960 godu, p. 645.

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Table A–5

USSR: Indexes of Growth of Industrial Fixed Capital Stock (End of Year)[a]

	1960 = 100[b]	
	1965	1969
USSR	169	234
RSFSR	167	229
Ukraine	164	225
Belorussia	210	(313)[c]
Moldavia	213	(317)
Lithuania	194	(308)
Latvia	177	(229)
Estonia	185	(230)
Georgia	(143)	(195)
Azerbaydzhan	(168)	(242)
Armenia	185	(300)
Kazakh	(182)	(269)
Uzbek	186	(287)
Kirgiz	167	(320)
Tadzhik	193	(385)
Turkmen	(178)	(284)

[a] Sources:
USSR: Narodnoye khozyaystvo SSSR v 1969 godu, p. 45.
RSFSR: Narodnoye khozyaystvo RSFSR v 1969 godu, p. 32.
Ukraine: Narodnoye khozyaystvo Ukrainskoy SSR v 1969 godu, p. 48.
Belorussia: Narodnoye khozyaystvo BSSR v 1968 godu, p. 27.
Moldavia: Narodnoye khozyaystvo Moldavskoy SSR v 1968 godu, p. 17; Sovetskaya Moldaviya k 50 letiyu Velikogo Oktyabrya, 1967, p. 23.
Lithuania: Ekonomika i kul'tura Litovskoy SSR, 1967, p. 89; 1968, p. 35; 1969, p. 117.
Latvia: Ekonomika i kul'tura Sovetskoy Latvii, 1966, p. 35; Narodnoye khozyaystvo Sovetskoy Latvii v 1968 godu, p. 46.
Estonia: Narodnoye khozyaystvo Estonskoy SSR v 1969 godu, p. 44.
Armenia: Isaakyan, G.D., Osnovne fondy promyshlennosti Armyanskoy SSR, 1970, p. 387.
Uzbekistan: Narodnoye khozyaystvo Uzbekskoy SSR v 1967 godu, p. 26.
Kirgizia: Narodnoye khozyaystvo Kirgizskoy SSR v 1967 godu, p. 11.
Tadzhik: Narodnoye khozyaystvo Tadzhikskoy SSR v 1965 godu, p. 28.

[b] All indexes based on 1955 rubles.

[c] All indexes in parentheses are estimated values derived by the perpetual inventory method as explained in the text of Appendix B.

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APPENDIX B

DISCUSSION OF STATISTICAL AND ANALYTICAL PROCEDURES

The Effect of Soviet Statistical Biases on Interregional Comparisons

The statistical data on national income and industrial output employed throughout this paper have been drawn exclusively from official Soviet sources and are subject to the biases inherent in Soviet concepts and statistical practices. Although the regional biases do not differ sufficiently to cause a significant change in the relative position of the regions, some regional differences in statistical bias still exist. These differences and their probable effect on the results of this paper are discussed below.

National Income Data

In Soviet practice, national income reflects the total net product of the "productive" sectors of the economy. This differs from the Western concept of net national product primarily in the exclusion of the service and government sectors from the Soviet data. The exclusion of services very likely has resulted in the underestimation of regional variations in per capita national income, since the value of services per capita is considerably greater in the European areas of the country than in the Central Asian and Transcaucasian republics.[30]

Probably the greatest degree of regional variation in the bias of national income data is due to the inclusion of turnover tax in the net product of industry.[31] This introduces different degrees of bias among the regions according to the branch structure of industry in each region, due to variations in the amount of turnover tax applied to different products. For instance, in 1969 the turnover tax component of wholesale prices averaged 4.2% in the branches of heavy industry and 22.1% in the branches of the light and food industries.[32] Thus, national income could be subject to more upward bias in regions with a greater share of light and food industries in their industrial structures. Nevertheless, a comparison of the relative positions of the union republics in terms of per capita national income in 1965, inclusive and exclusive of turnover tax,[33] reveals that regional variations in the bias resulting from inclusion of the turnover tax do not significantly change the ranking of the republics (see Table B-1), and have virtually no effect on the findings of this paper, with respect to regional variations in the level of per capita national income.

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[30] For example, the data given for personal services in **SSSR v tsifrakh v 1970 godu**, p. 227, indicates that the value of such services per capita ranges from 11 rubles in Azerbaydzhan and Uzbekistan to 27 rubles in Estonia.

[31] The turnover tax incidence is a result of budget practice rather than production relations, and a distribution of net products, by sector, including turnover tax distorts the actual situation.

[32] **Narodnoye khozyaystvo SSSR v 1969 godu**, p. 191.

[33] Per capita national income data exclusive of turnover tax in 1965 were obtained from Vedishchev, **op. cit.**, p. 82.

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Table B-1

USSR: Ranking of Republics, by Per Capita National Income, Inclusive and Exclusive of Turnover Tax
1965

Inclusive of Turnover Tax	Exclusive of Turnover Tax
Latvia	Estonia
Estonia	Latvia
RSFSR	RSFSR
Lithuania	Lithuania
Ukraine	Ukraine
USSR Average	*USSR Average*
Moldavia	Moldavia
Belorussia	Belorussia
Armenia	Armenia
Georgia	Kazakh
Azerbaydzhan	Georgia
Turkmen	Kirgiz
Kirgiz	Uzbek
Kazakh	Azerbaydzhan
Uzbek	Turkmen
Tadzhik	Tadzhik

Regional indexes of national income growth are also affected differently, depending on the branch structure of industry in each region. Since the light and food industries generally experience slower growth than heavy industry, regions with a greater share of the former in their industrial structures will naturally display slower growth rates of national income. The turnover tax element in the net product of the light and food industries exaggerates the weight of these branches and therefore causes an understatement of economic growth. Nevertheless, the relative rates of industrial growth, by region, should not be affected appreciably by the inclusion of the turnover tax.

Industrial Output Data

The sector defined as industry includes manufacturing (including munitions), mining, electric power generation, lumbering, and fishing. The official production indexes extracted from the statistical handbooks of the USSR and the RSFSR, are indexes of gross industrial production (*valovaya produktsiya promyshlennost'*). These indexes represent the sum of the gross production of all industrial enterprises, where the gross production of each enterprise is calculated by multiplying the output of each product by its price (excluding turnover taxes) as of a base year. Only those products produced by an enterprise solely for internal use in the production of its primary products are excluded from the gross production of an enterprise.[34]

These indexes are subject to several defects when used to estimate growth. Multiple weights will be assigned to some industrial activities due to interindustry transactions, and if those activities are growing faster than others that are less heavily weighted, the index will be overestimated. To the extent that this occurs, regions with relatively greater concentrations of technically related industries (that is, the European regions) may incur a relatively greater inflationary bias in growth. Another defect is that the indexes are sensitive to changes in the organizational structure of industry. As the degree of specialization increases,

[34] Narodnoye khozyaystvo SSSR v 1967 godu, p. 821.

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the number of independent enterprises and accounting units, and with them the gross value of industrial production, will increase. Thus, increases in the gross value of industrial production after 1965 may to some extent be a reflection of the abolition of the councils of national economy and the return to the branch system of administration.

The greatest inflationary defect of these indexes is probably the method by which new products are introduced into the indexes. New products and modified or improved old ones are assigned prices ostensibly equivalent to prices that would have existed in the base year. In practice this has usually meant the initial unit cost of production, which is generally very high and includes developmental expenses. This practice, coupled with the tendency of new products to grow more rapidly in output than older ones, may cause greater inflation of the growth rates of industrial production in the European regions of the country where conditions are more conducive to the introduction of new products.

There is little doubt that some of the regional variations in both the level and growth of per capita industrial output are attributable to the problems discussed above. However, the regional variations in industrial production seem far too great to be explained predominantly by variations in statistical bias.

Derivation of Industrial Inputs and Combined Factor Productivity

The Input Series

Perhaps the most serious deficiency in the analysis is the lack of adequate regional data on factor inputs other than labor and capital. There does not appear to be any tractable method of imputing inputs from other sectors, particularly agriculture, to the industrial sector on a regional basis. Although a fairly detailed input-output table exists for the country as a whole, there is no reason to expect that the coefficients would realistically represent the techniques of individual regions, and use of these coefficients would probably compound the existing margin of error.

Indexes of labor services

The indexes of labor inputs are based on published Soviet data: the average annual number of wage earners and salaried personnel in industry, the average number of days worked per man-year in industry, and the average number of hours worked per man-day. Data on hours worked per man-day and days worked per man-year are available only for the USSR as a whole and had to be assumed relevant for each region. To the extent that this assumption is violated, the indexes of labor inputs are not fully comparable with those of output. Another problem of matching the coverage of inputs and outputs occurs in the labor series because of the exclusion of industrial workers participating in minor industrial production activities on collective farms whose output is included in the indexes of industrial production.[35]

Indexes of industrial gross fixed capital stock

Data on the growth of industrial gross fixed capital stock, by union republic, were obtained both directly from Soviet statistical sources and indirectly from

[35] **Trud v SSSR**, Moscow, 1968, p. 81.

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estimates of the ruble value of industrial gross fixed capital stock derived by the perpetual inventory method.[36] Conceptually, those indexes are less desirable as surrogates for the growth of capital services than indexes of average annual gross fixed capital stock would be, since the indexes presented here represent stock as of the end of the year. However, in the absence of firm data on the annual ruble value of industrial gross fixed capital, by republic, from which indexes of average annual gross fixed capital stock could be derived, the end-of-year indexes represent a feasible alternative for indicating the relative order of magnitude in the growth of capital services among the union republics. The growth indexes of industrial gross fixed capital stock for 1965 and 1969 (with 1960 as the base year) are presented in Table A–5. Those in parentheses represent values estimated by the perpetual inventory method.

Four basic steps were followed in obtaining the estimated indexes. First, estimates of the ruble value of industrial gross fixed capital stock at the end of 1960 were derived as shown in Table B–2. For each republic except Georgia, Azerbaydzhan, Kazakhstan, and Turkmenia this value was moved forward by the reported growth index to the most recent year for which the index was given. The perpetual inventory method was then applied for the remaining years to obtain a ruble value of industrial gross fixed capital stock at the end of 1969.

No growth indexes were available for Georgia, Azerbaydzhan, Kazakhstan, and Turkmenia, so the perpetual inventory method had to be used for all years. Because republic data on the changes in unfinished construction were not available, the perpetual inventory method tends to overstate somewhat the growth of industrial fixed capital stock each year. The stock of unfinished construction typically grows faster than total investment. Thus, when the values of industrial fixed capital stock were summed for all republics at the end of 1965, they totaled 152.24 billion rubles, or 2.24 billion rubles more than the reported total for the USSR. On the assumption that the reported growth indexes for the other 11 republics were accurate, this error was attributed solely to the estimating procedure, and the four estimated values for 1965 were adjusted proportionally to add to the difference between the sum of the 11 republics for which data were reported and the total for the USSR. Starting from these adjusted values, the perpetual inventory method was again applied through 1969. The sum of all republic values at the end of 1969 was 211.33 billion rubles, or 3.33 billion rubles over the reported total for the USSR. Therefore, the estimated values were adjusted as before, and indexes of growth were then calculated from ratios of the adjusted values to the 1960 values.

In addition to the lack of data on changes in unfinished construction mentioned above, two other factors associated with the perpetual inventory method may have affected the accuracy of the estimates. Since retirement rates for industrial fixed capital stock, by republic, were not available, the all-union retirement rates were applied to the values of industrial gross fixed capital stock of each republic. Second, industrial investment data for some republics (and

[36] The perpetual inventory method can be expressed as follows:

$$S_t - [(S_t) \cdot (R_t)] + I_t = S_{t+1}$$

where

S_t = Gross fixed capital stock at the beginning of the year t.
R_t = Rate of retirements in the year t.
I_t = Investment during the year t.
S_{t+1} = Gross fixed capital stock at the beginning of the year t+1.

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Table B-2

USSR: Derivation of Industrial Gross Fixed Capital Stock at the End of 1960 *

	Distribution of Fixed Capital Stock At Beginning of Year		Annual Retirement Rate	Estimated Retirements in 1960	1 Jan. Fixed Capital Left at End of Year	Commissionings of Fixed Capital in 1960	Estimated Value of Fixed Capital at end of 1960	Share of Total Fixed Capital in Industry		Fixed Capital in Industry Adjusted
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Percent	Billion Rubles	Percent	Billion Rubles				Percent	Billion Rubles	
RSFSR	66.0	206.6	1.2	2.5	204.1	20.2	224.3	29.6	66.4	66.8
Ukraine	17.0	53.2	1.2	0.6	52.6	5.8	58.4	28.0	16.2	14.5
Belorussia	1.9	5.9	1.2	0.1	5.8	0.8	6.6	15.5	1.0	1.0
Moldavia	0.5	1.6	1.2	Negl.	1.6	0.3	1.9	14.0	0.3	0.3
Lithuania	0.9	2.8	1.2	Negl.	2.8	0.3	3.1	17.5	0.5	0.5
Latvia	1.2	3.8	1.2	Negl.	3.8	0.3	4.1	16.7	0.7	0.7
Estonia	0.8	2.5	1.2	Negl.	2.5	0.2	2.7	20.2	0.5	0.5
Georgia	1.5	4.7	1.2	0.1	4.6	0.4	5.0	21.2	1.1	1.0
Azerbaydzhan	2.1	6.6	1.2	0.1	6.5	0.5	7.0	20.6	1.4	1.3
Armenia	0.6	1.9	1.2	Negl.	1.9	0.2	2.1	23.6	0.5	0.5
Kazakh	4.6	14.4	1.2	0.2	14.2	2.3	16.5	21.2	3.5	3.3
Uzbek	1.6	5.0	1.2	0.1	4.9	0.9	5.8	22.5	1.3	1.2
Kirgiz	0.4	1.3	1.2	Negl.	1.3	0.2	1.5	19.3	0.3	0.3
Tadzhik	0.3	0.9	1.2	Negl.	0.9	0.2	1.1	21.0	0.2	0.2
Turkmen	0.6	1.9	1.2	Negl.	1.9	0.3	2.2	20.6	0.5	0.5

* Derivations and sources for the columns.

Column (1). Percentage share of USSR total gross fixed capital stock on 1 January 1960, from Ostroumov, V.S., and Shevchuk, A.V., **Osnovne fondy USSR,** Moscow, 1963, p. 23. According to the authors, these data were calculated on the basis of the revalued fixed capital stock on 1 January 1960.

Column (2). Share of total gross fixed capital stock on 1 January 1960 times 313 billion rubles. The value for the USSR (313 billion rubles) was derived by moving the revised 1 January 1961 value of gross fixed capital stock back to 1 January 1960 through use of the 1961/1960 index appropriate to the originally published values for 1960 and 1961.

Column (3). Retirement rate for the USSR in 1960 for total gross fixed capital stock.

Column (4). Retirements in 1960; column (2) times column (3).

Column (5). Column (2) minus column (4).

Column (6). Total commissionings of fixed capital in 1960, from **Narodnoye khozyaystvo SSSR v 1969 godu,** p. 494.

Column (7). Value of total gross fixed capital stock at the end of 1960: column (5) plus column (6).

Column (8). Percentage share of total gross fixed capital stock in industry at end of 1960. For all republics, except Azerbaydzhan and Turkmenia, these data were extracted from the statistical handbooks (**Narodnoye khozyaystvo** publications) for the respective republics. The shares listed for Azerbaydzhan and Turkmenia represent the mean value of the other 13 republics.

Column (9). Value of industrial gross fixed capital stock at end of 1960; column (7) times column (8).

Column (10). Column (9) adjusted to add to the total industrial gross fixed capital stock for the USSR at end of 1960 (column (9) divided by the sum of column (9) and then multiplied by the total for the USSR). Because of the rounded nature of the official data used in these calculations, the data in the columns may not add to the total for the USSR.

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for all republics in 1969) had to be estimated by first calculating the average percentage share of industrial investment in total investment over the previous period of five to eight years and then applying this figure to total investment for the year(s) in question. Although the extent of any error introduced by these procedures is unknown, it is not very likely that any such error could appreciably distort the relative order of magnitude of industrial capital stock among the republics.

The Relation of Inputs to Outputs

The production function used to combine the labor and capital inputs is the familiar Cobb-Douglas function, $Q = AL^aK^b$, with $a + b = 1$. Because it is believed that neither perfect nor zero substitutability among inputs is reasonable for a sector as comprehensive as industry, an intermediate assumption seemed to be called for. Therefore, the assumption of unitary elasticity of substitution was made for this analysis.

In estimating the production function coefficients, it was assumed that labor and capital inputs were paid the value of their marginal products in the base year; and, for each region, the shares of labor and capital in total value added in industry were derived exogenously from the production function. The average annual wages of workers and salaried employees together with social insurance deductions were taken to reflect the values of the marginal product of labor. Since there was no explicit accounting of a return to capital in the Soviet Union until 1966, the somewhat arbitrary interest rate of 8% was assumed and combined with a depreciation allowance to simulate the return on capital. This combined rate was applied to all regions. The interest rate of 8% was chosen on the basis that it is one of the two rates employed in previous studies of this nature (the other being 20%) and is closer to the experimental 6% rate instituted by the Soviets in 1966 than is the 20% rate. The specific steps followed in deriving the production function coefficients are outlined in the notes to Table B–3.

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Table B–3

USSR: Derivation of Estimated Production Function Coefficients in Base Year 1960 [a]

	(1) Industrial Employment	(2) Average Annual Wages	(3) Social Insurance Deductions	(4) Labor Costs	(5) Fixed Capital Stock	(6) Imputed Interest and Amortization	(7) Capital Costs	(8) Total Costs	(9) Labor Coefficient	(10) Capital Coefficient
	Thousand Persons	*Rubles*	*Percent*	*Billion Rubles*		*Percent*	*Billion Rubles*			
USSR	22,291	1,099.2	7.0	26.22	89.0	12.14	10.80	37.02	0.708	0.292
RSFSR	15,139	1,100.4	7.0	17.83	63.3	12.14	7.68	25.51	0.699	0.301
Ukraine	4,028	1,120.8	7.0	4.83	14.5	12.14	1.76	6.59	0.733	0.267
Belorussia	533	1,099.2	7.0	0.63	1.0	12.14	0.12	0.75	0.840	0.160
Moldavia	122	1,099.2	7.0	0.14	0.3	12.14	0.04	0.18	0.778	0.222
Lithuania	210	1,003.2	7.0	0.23	0.5	12.14	0.06	0.29	0.793	0.207
Latvia	272	1,032.0	7.0	0.30	0.7	12.14	0.08	0.38	0.789	0.211
Estonia	161	1,111.2	7.0	0.19	0.5	12.14	0.06	0.25	0.759	0.241
Georgia	270	1,099.2	7.0	0.32	1.0	12.14	0.12	0.44	0.727	0.273
Azerbaydzhan	219	1,089.2	7.0	0.26	1.3	12.14	0.16	0.42	0.619	0.381
Armenia	142	1,099.2	7.0	0.17	0.5	12.14	0.06	0.23	0.739	0.261
Kazakh	561	1,099.2	7.0	0.66	3.3	12.14	0.40	1.06	0.623	0.377
Uzbek	366	966.0	7.0	0.38	1.2	12.14	0.15	0.53	0.717	0.283
Kirgiz	107	966.0	7.0	0.11	0.3	12.14	0.04	0.15	0.733	0.267
Tadzhik	74	966.0	7.0	0.08	0.2	12.14	0.02	0.10	0.800	0.200
Turkmen	67	966.0	7.0	0.07	0.5	12.14	0.06	0.13	0.538	0.462

[a] Derivations and sources for the columns.

Column (1). From **Trud v SSSR**, pp. 40–70 and 81.

Column (2). Average annual wages in industry were available only for Estonia, Latvia, Lithuania, the Ukraine, Uzbekistan, the RSFSR, and the USSR. Wages for Kirgizia, Tadzhikistan, and Turkmenia were assumed to be the same as for Uzbekistan. For the remaining republics, wages were assumed to be the same as for the USSR. Sources: **Narodnoye khozyaystvo Estonskoy SSR v 1969 godu**, p. 20; **Latviya v tsifrakh v 1968**, p. 312; **Ekonomika i kultura Litovskoy SSR v 1969 godu**, p. 335; **Narodnoye khozyaystvo Ukrainskoy SSR v 1965 godu**, p. 478; **Narodnoye khozyaystvo RSFSR v 1969 godu**, p. 317; **Narodnoye khozyaystvo SSSR v 1969 godu**, p. 539.

Column (3). Social insurance deduction rate for the USSR from Noren, J.H., "Soviet Industry Trends in Output, Inputs, and Productivity," US Congress, Joint Economic Committee, **New Directions in the Soviet Economy**, Washington, 1966, p. 304. This rate was assumed relevant for all republics. This assumption is somewhat less than satisfactory, as the rate for the USSR is an average of the various branches of industry. Thus, no account is taken for differences in industrial structure among the regions.

Column (4). The product of column (1) times column (2) was multiplied by the sum of 1 plus column (3).

Column (5). From Table B–2, column 10.

Column (6). The amortization charge for the USSR (4.14%) was taken from Noren, **loc. cit.** This charge was combined with an 8% interest charge on capital stock and the combined rate (12.14%) was applied to all republics.

Column (7). Column (5) times column (6).

Column (8). Column (4) plus column (7).

Column (9). Column (4) divided by column (8).

Column (10). One minus column (9).

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